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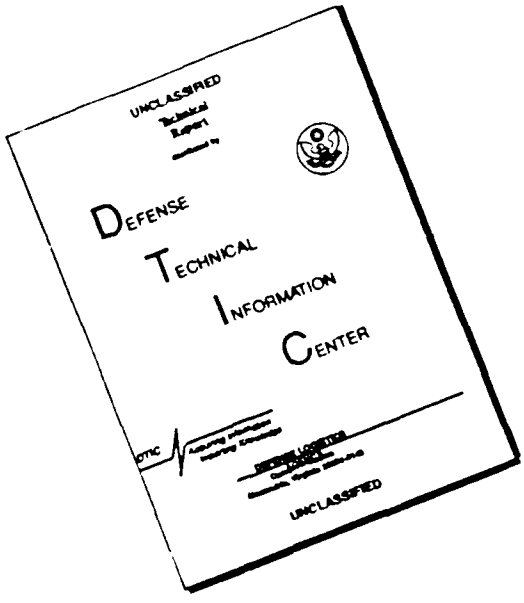

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FINDING OF NO SIGNIFICANT IMPACT

NAME OF ACTION: GROUND WAVE EMERGENCY NETWORK
NORTH CENTRAL TEXAS RELAY NODE

DESCRIPTION OF PROPOSED ACTION ALTERNATIVES:

The U.S. Air Force plans to construct a radio communications relay node in north central Texas (Knox County) as part of the Ground Wave Emergency Network (GWEN) communications system. Five action alternatives associated with five candidate GWEN sites (CGSs) in north central Texas and the no action alternative have been considered and evaluated in an environmental assessment (EA).

GWEN is a radio communications system designed to relay emergency messages between strategic military areas in the continental United States. The system is immune to the effects of high-altitude electromagnetic pulse (HEMP) energy surges caused by nuclear detonations in the ionosphere that would disrupt conventional communications equipment. A failure of such equipment would prevent timely communications among top military and civilian leaders and strategic Air Force locations and prevent U.S. assessment and retaliation during an attack. GWEN is an essential part of a defense modernization program to upgrade and improve our nation's communications system, thereby strengthening deterrence.

The GWEN system is a network of relay nodes, receive-only stations, and input/output stations. The relay node in north central Texas would be part of the Final Operational Capability (FOC) phase of the GWEN system and would establish essential links with adjacent nodes in the network.

In September 1987, the U.S. Air Force Electronic Systems Division, Hanscom Air Force Base, Massachusetts published a Final Environmental Impact Statement (FEIS) for the GWEN FOC that addressed the system as a whole and identified expected environmental effects common to all sites. Section 5 of the FEIS described a siting process that is designed to minimize the potential for environmental impacts. This process has three distinct phases: network definition, regional screening, and individual site evaluation. Network definition identified the need for a relay node in north central Texas. Regional screening resulted in the identification of five CGSs in north central Texas that met the exclusionary and evaluative criteria described in that FEIS. Individual site evaluation examined the relative suitability of the CGSs through site-specific technical studies. The EA is a part of the third phase and is tiered from that FEIS. It addresses the potential environmental effects of the five action alternatives and the no action alternative.

The proposed relay node in north central Texas will be an unmanned facility located on approximately 11 acres of land and, once constructed, will resemble an AM radio broadcast station. The facility will consist of a 299-foot-tall, low-frequency (LF) transmitter tower, three equipment shelters, an access road, and associated fences. The tower will be supported by 24 guy wires, including 12 top-loading elements. An equipment shelter at the tower base will contain an antenna tuning unit. An 8-foot-high chain link fence topped with barbed wire will surround the tower base and associated equipment shelter. A radial ground plane, composed of 100, 0.128-inch-diameter copper wires buried about 12 inches underground, will extend out about 330 feet from the tower base. A 4-foot-high fence will be installed around the perimeter of the copper radials.

A second equipment area located at the site perimeter will contain two shelters housing a back-up power group (BUPG) with two internal fuel storage tanks and radio processing equipment. The BUPG will operate during power outages and for testing purposes. An LF receive antenna, consisting of a pair of 4-foot-diameter rings mounted on a 10-foot pole, and an ultrahigh-frequency (UHF) antenna, used for communicating with airborne input/output terminals and consisting of a 9-foot-high whip-like antenna mounted on a 30-foot-high pole, will also be located in this area. An 8-foot-high chain link fence topped with barbed wire will enclose the entire equipment area. A 10-foot-wide gravel road will connect this area to the tower base. A 12-foot-wide gravel road will provide access to the site from a public road.

The station will use existing commercial three-phase electric power and telephone service. Power and telephone service will be brought to the site through either overhead or buried lines, depending on local utility practices. In its ready status, the antenna will transmit in the LF radio band at 150 to 175 kilohertz for a total of 6 to 8 seconds per hour.

Three of the five action alternatives are discussed in this Finding of No Significant Impact (FONSI). Because of significant visual impacts at the Scott (CGS-3) and Smajstrla (CGS-5) sites, these sites will not be considered in this FONSI.

ANTICIPATED ENVIRONMENTAL EFFECTS

The EA evaluated potential impacts to the physical, biological, and socio-cultural environment from construction and operation of the relay node.

The project would have no significant impacts on physical resources. Erosion and increased runoff would be minimized by using proper erosion control techniques during construction and by replanting the site afterwards. Impacts on mineral resources would be minor. Paleontological resources are not likely to occur in the soil cover on the sites; therefore impacts to them are not anticipated. A maximum of 11 acres of prime farmland would be removed from production. Water quality would not be significantly affected because increases in copper concentrations due to corrosion of the ground plane would be negligible. Air quality would not be significantly affected. During construction, temporary and insignificant increases in emissions would occur, and during operation, emissions from the BUPG would not be sufficient to result in violation of air quality standards.

The project would have no significant impacts on biological resources. The sites are located on agricultural fields and do not contain sensitive wildlife habitat. The sites are not within 300 feet of wetlands, nor are they within a 100-year floodplain. Informal consultation with the U.S. Fish and Wildlife Service indicated that the project would not likely affect any threatened or endangered species. The Texas Parks and Wildlife Department indicated that no state-listed rare, threatened, or endangered species or unique biological community would be affected by the project. Bird-tower collisions may occur but would not be significant because the tower would be located away from primary bird habitats and migration routes.

The project would have no significant impacts on socio-cultural resources. Construction would have a small, beneficial impact on the local economy, in part by providing temporary employment for contractors and construction workers. Community support systems would not be significantly affected. Land use and noise impacts would not be significant. The relay node signal would not interfere with commercial television or radio broadcasts, amateur radio operations, garage door openers, or pacemakers. Radio-frequency emissions outside the fenced area around the tower base would not pose a health hazard to humans or animals. The Texas Historical Commission was consulted and has concurred that the project would not affect significant cultural resources. Significant impacts to Native American traditional, religious or sacred sites are not anticipated. A visual analysis conducted in accordance with the criteria developed in the FOC FEIS concluded that the relay node facility would not cause significant visual impacts.

CONCLUSIONS:

No significant impacts to the surrounding environment would be caused by construction and operation of the proposed relay node on the Walker, (CGS-2), Homer (CGS-6), or Parris (CGS-7) site. Therefore, an environmental impact statement for a GWEN relay node at the cited locations in north central Texas is not required.

David O. Williams, Colonel, USAF
Chairman
HQ ESC Environmental Protection Committee

25 Jun 93
Date

PREFERRED GWEN SITE REPORT
NORTH CENTRAL TEXAS

The U.S. Air Force is proposing to construct a relay node for the Ground Wave Emergency Network (GWEN) in North Central Texas. The Air Force has followed the siting process described in Section 5 of the Final Environmental Impact Statement (FEIS) for the Final Operational Capability (FOC) phase of the GWEN program to identify alternative Candidate GWEN Sites (CGSs). The five CGSs identified in North Central Texas are referred to as the Walker, Scott, Smajstrla, Homer, and Parris sites.

This report summarizes the process of selecting the preferred site from the five CGSs. This PGSR, along with a site-specific Environmental Assessment (EA) and Finding of No Significant Impact (FONSI), is also being distributed for information and comment in compliance with the Air Force's process of Interagency and Intergovernmental Coordination for Environmental Planning (IICEP).

Operational, environmental, and developmental suitability; construction and real estate acquisition costs; and public comments and concerns are all factors which have been considered in arriving at the selection of the preferred site.

Without an **operationally suitable** location, connectivity of the relay node in North Central Texas to the GWEN network cannot be achieved. Ground conductivity measurements are acceptable at all five CGSs. UHF line-of-site coverage for a potential airborne interface would be largely uninhibited at all five sites. During the site-specific studies, no radio frequency interference was detected in the GWEN frequency bands which would interfere with the operation of the GWEN receiver. Also, operations at any of the sites would pose no interference with other known systems. Therefore, all five CGSs are operationally suitable.

The next major factor considered in the selection of the preferred site was **environmental suitability**. The environmental suitability of each CGS was determined from information provided by an independent field analysis and is documented in the EA. The EA for the five CGSs was completed in February 1993. The environmental analysis found that construction of a GWEN relay node at the Scott and Smajstrla sites would create significant visual impacts to residential areas in the communities of Vera and Rhineland, respectively. No significant impacts would result from construction of a GWEN relay node at the Walker, Homer, or Parris sites. Therefore, a FONSI for these three sites was completed on 25 February 1993. Thus, three of the five CGSs are environmentally suitable, but none of these three are environmentally favored over the others.

All five CGSs are **suitable for development** as a GWEN relay node. The FAA has approved construction of the GWEN relay node at any of the five CGSs. However, the **construction costs** at the sites vary

and are a discriminator in the selection of the preferred site. The Walker, Scott, and Parris sites must be set back 150 feet from the existing right of way for U.S. Highway 82 to allow for future widening of the road, requiring approximately 150 feet of additional access road construction and extension of three-phase power and telephone services. The Smajstrla and Homer sites do not require any such additional construction costs. Thus, of the three operationally, environmentally, and developmentally suitable sites, the Homer site is favored for lower construction cost.

Real estate negotiations have been completed for the Smajstrla, Homer, and Parris sites. All three landowners prefer to sell their property. Negotiations were never completed for the Walker and Scott sites. Of the three operationally, environmentally, and developmentally suitable sites, negotiations have been completed for two, the Homer and Parris sites. Of these two, negotiations for the Parris site are slightly more favorable.

With operational, environmental, and developmental factors evaluated and acquisition and construction costs considered, the Air Force prefers the Homer site. The Homer site is preferred because it is operationally, environmentally, and developmentally suitable and is the least expensive site to develop.

Therefore, I have selected the Homer site as the Air Force's preferred site for development as the GWEN relay node in North Central Texas. After reviewing the information received during the NCEP process, I will direct final land acquisition activities and construction of the GWEN relay node.

STEPHEN T. MARTIN, Lt Col, USAF
Program Manager, GWEN

1 March 93
(Date)

GROUND WAVE EMERGENCY NETWORK
FINAL OPERATIONAL CAPABILITY

ENVIRONMENTAL ASSESSMENT
FOR
NORTH CENTRAL TEXAS RELAY NODE

SITE NO. RN 8C915TX

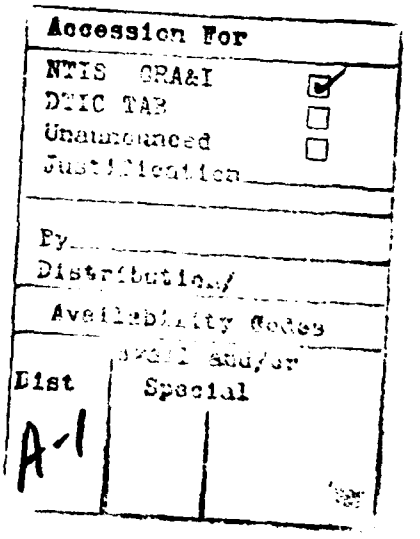
11 February 1993

Electronic Systems Center
Air Force Material Command, USAF
Hanscom AFB, Massachusetts 01731-1623

GROUND WAVE EMERGENCY NETWORK
FINAL OPERATIONAL CAPABILITY

ENVIRONMENTAL ASSESSMENT
FOR
NORTH CENTRAL TEXAS RELAY NODE
SITE NO. RN 8C915TX

11 February 1993



Electronic Systems Center
Air Force Material Command, USAF
Hanscom AFB, Massachusetts 01731-1623

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SUMMARY

The Ground Wave Emergency Network (GWEN) is a radio communication system designed to relay emergency messages between strategic military areas in the continental United States. The system is immune to the effects of high-altitude electromagnetic pulse (HEMP) energy surges caused by nuclear bursts in the ionosphere that would disrupt conventional communications equipment such as telephones and shortwave radios. A failure of such equipment would prevent timely communications among top military and civilian leaders and strategic Air Force locations and prevent U.S. assessment and retaliation during an attack. GWEN is an essential part of a defense modernization program to upgrade and improve our nation's communications system, thereby strengthening deterrence.

The GWEN system consists of a network of relay nodes, receive-only stations, and input/output stations. Each relay node, such as the one proposed in north central Texas, consists of a guyed radio tower facility similar to those used by commercial AM broadcast transmitters.

A Final Environmental Impact Statement (FEIS) for the GWEN Final Operational Capability (FOC) was published in September 1987 by the Electronic Systems Division, Hanscom Air Force Base, Massachusetts. That FEIS addressed the GWEN system as a whole, identifying expected environmental effects common to all sites. Section 5, beginning on page 5-1 of the FEIS describes a siting process that is designed to minimize the potential for environmental impacts. This process has three distinct phases: network definition, regional screening, and individual site evaluation.

Phase 1, network definition, identified the geographic coordinates that met the operational needs and technical constraints of the network. Each set of coordinates became the center of a circular site search area (SSA) with a 9-mile radius (250 square miles). The SSA discussed in this Environmental Assessment (EA) contains portions of Knox and Baylor counties, and was centered 3.6 miles south of the town of Vera and 5.3 miles northeast of the town of Rhineland in Knox County in north central Texas, at latitude 33.58° N and longitude 99.58° W. The principal towns in the SSA are Goree and Munday.

Phase 2, regional screening, involved the application of exclusionary and evaluative criteria to the SSA to avoid environmentally sensitive areas. The remaining areas, called potential areawide sites (PAWS), became the focus of the siting process. The field investigation for north central Texas was conducted in October 1989. Thirty-four sites were identified during automobile-based surveys as potential candidate GWEN sites (PCGSs). Attempts were made to contact the owners of the sites to determine their interest in selling or leasing land to the Government. Rights-of-entry were granted to investigate ten PCGSs. Following evaluation against the environmental siting criteria set forth in the FEIS, five of the ten PCGSs were recommended as candidate GWEN sites (CGSs) for further review. All five CGSs are located in Knox County. These CGSs were described in the Preliminary Site Evaluation Report (PSER) of December 14, 1989.

Subsequent to the release of the PSER, three of the CGSs (Walker, CGS-2; Scott, CGS-3; Parris, CGS-7) were moved back 150 feet from the highway right-of-way to allow for future expansion of U.S. Highway 82. The analyses presented in this EA apply to the new site locations. Also subsequent to the PSER being issued, two CGS landowners withdrew two sites from consideration (Walker, CGS-2; Scott, CGS-3). These landowners are no longer interested in leasing or selling land to the Air Force. However, since the site-specific studies had been accomplished on these sites prior to the owners' withdrawal and because these sites continue to be considered viable alternatives, the Air Force has presented this data on the withdrawn sites in this EA.

Phase 3, individual site evaluation, involves evaluating the relative suitability of the candidate sites through site-specific technical studies. This EA is a product of those evaluations and discusses the five siting alternatives in north central Texas. It addresses only those criteria that apply to the candidate sites. The sixth alternative, no action, would impair performance of the GWEN system but leave the environment unchanged.

To be suitable for construction and operation, a site should measure at least 700 by 700 feet (approximately 11 acres), be relatively level and undeveloped, be free of natural or man-made obstructions, and have soils capable of supporting relay node structures. The site should also be close to all-weather roads, commercial three-phase power, and

telephone lines to minimize costs. To operate effectively, the site must be located at least a minimum distance from obstructions that could affect reception and transmission. These include buildings and towers, high-voltage power lines, and other communications systems or sources of radio-frequency interference. Specific minimum distances depend on height and power levels of identified obstructions or interfering sources.

This EA shows that construction and operation of a GWEN relay node would have significant visual impacts on the Scott (CGS-3) and Smajstrla (CGS-5) sites. These are discussed in Sections 4.3 and 4.4 of this EA.

The project would have no significant impacts if built on the Walker (CGS-2), Homer (CGS-6), or Parris (CGS-7) site. During the 6-week construction period, the project would cause temporary and insignificant air quality and noise impacts and slight increases in traffic. The project would have a small, beneficial impact on the local economy, in part because it would provide temporary employment for contractors and construction workers. If built on any of the above three sites, the project would have no significant impacts on air quality; water quality; land use; mineral resources; known paleontological resources; biological resources, including threatened and endangered species; or cultural resources that are listed, eligible, or potentially eligible for listing on the National Register of Historic Places. Visual impacts would not be significant. Radio-frequency emissions outside the fenced area around the tower base would not pose a health hazard to humans or animals.

1.0 PURPOSE AND NEED FOR ACTION

The proposed action covered by this Environmental Assessment (EA) includes construction and operation of a relay node of the Ground Wave Emergency Network (GWEN) in north central Texas (see Figure 1.1 of this EA). This relay node will provide essential connections with adjacent nodes in the network. The major features of a GWEN relay node and associated environmental impacts common to all sites are addressed in the Final Environmental Impact Statement (FEIS) for the Final Operational Capability (FOC) phase of GWEN, which was published in September 1987 by the Electronic Systems Division, Hanscom Air Force Base, Massachusetts. This EA is tiered from that FEIS and addresses site-specific conditions at the candidate GWEN sites (CGSs) for this particular site search area (SSA).

The purpose of GWEN is to provide to the President and the National Command Authority a strategic communications network that is immune to the effects of high-altitude electromagnetic pulse (HEMP) and will carry critical attack warning and force execution data. As a result, GWEN will remove any possibility of potential aggressors taking advantage of the electromagnetic pulse generated by a high-altitude nuclear burst. A HEMP surge would disrupt the nation's electric power line transmission capability, cripple electronic devices, and adversely affect skywave communications networks based on conventional electronics. GWEN provides a low-frequency (LF) ground wave communication network that will not be affected by HEMP effects. It thereby strengthens deterrence by removing the option of beginning an attack against the United States by using HEMP effects.

A partial GWEN network, called the Thin Line Connectivity Capability (TLCC), has been completed. It contains 8 input/output stations, 30 receive-only stations, and 54 relay nodes. The TLCC provides a limited level of HEMP-protected communications to strategic forces and the National Command Authority.

The FOC phase of GWEN will add 29 relay nodes. The FOC will allow communication along several routes, thereby enhancing system availability and ensuring that vital communications will be maintained.

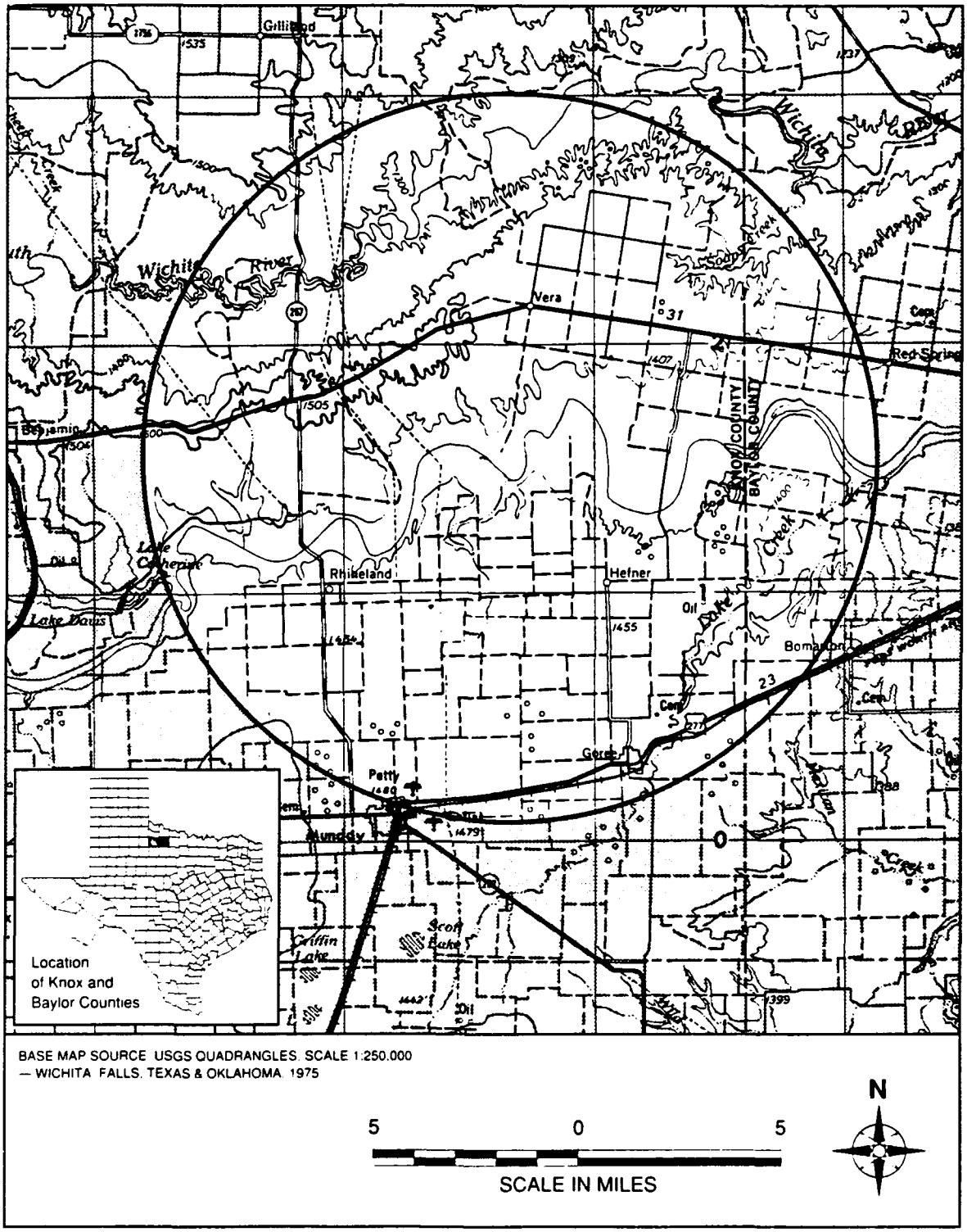


FIGURE 1.1 NORTH CENTRAL TEXAS SITE SEARCH AREA (SSA), KNOX AND BAYLOR COUNTIES, TEXAS

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The five action alternatives are site-specific applications of the standard relay node design presented in the FEIS. Consequently, they share a number of features that are discussed in Section 2.1 of this EA. The site-specific features are discussed in Sections 2.2 through 2.6 of this EA. Site descriptive data was obtained during field investigations conducted in October 1989. Figure 2.1 of this EA shows the five CGSs in relation to the major features of the SSA. Figure 2.2 and Appendix B of this EA show the locations of the CGSs in relation to roads and surrounding topography, respectively.

2.1 Common Features of the Action Alternatives

2.1.1 Site Selection Process

The process used to select sites is described in Section 5, beginning on page 5-1 of the FEIS. This process has three distinct phases: network definition, regional screening, and individual site evaluation. Appendix A of this EA provides a diagram of the site selection process. The environmental criteria used in this process are defined in Tables 5-1 and 5-2, pages 5-7 through 5-14 of the FEIS.

Phase 1, network definition, involved locating network nodes to optimize their performance while serving a predetermined number of users. A typical GWEN ground wave has an effective range of about 150 to 200 miles. Thus, relay nodes could not be located independently; changing the location of one would affect the connectivity with other nodes in the network. Once the optimal coordinates of the relay nodes were identified, a 9-mile-radius SSA was defined around each point to provide suitable opportunity for siting a relay node near that point. The 9-mile radius was chosen because it provided a reasonably sized search area consistent with the technical constraints on the relay node. If a significant portion of an SSA fell within an environmentally highly sensitive area such as a national park or wilderness area, an alternative was selected and its connectivity evaluated. This process was repeated until all relay nodes fell outside such areas.

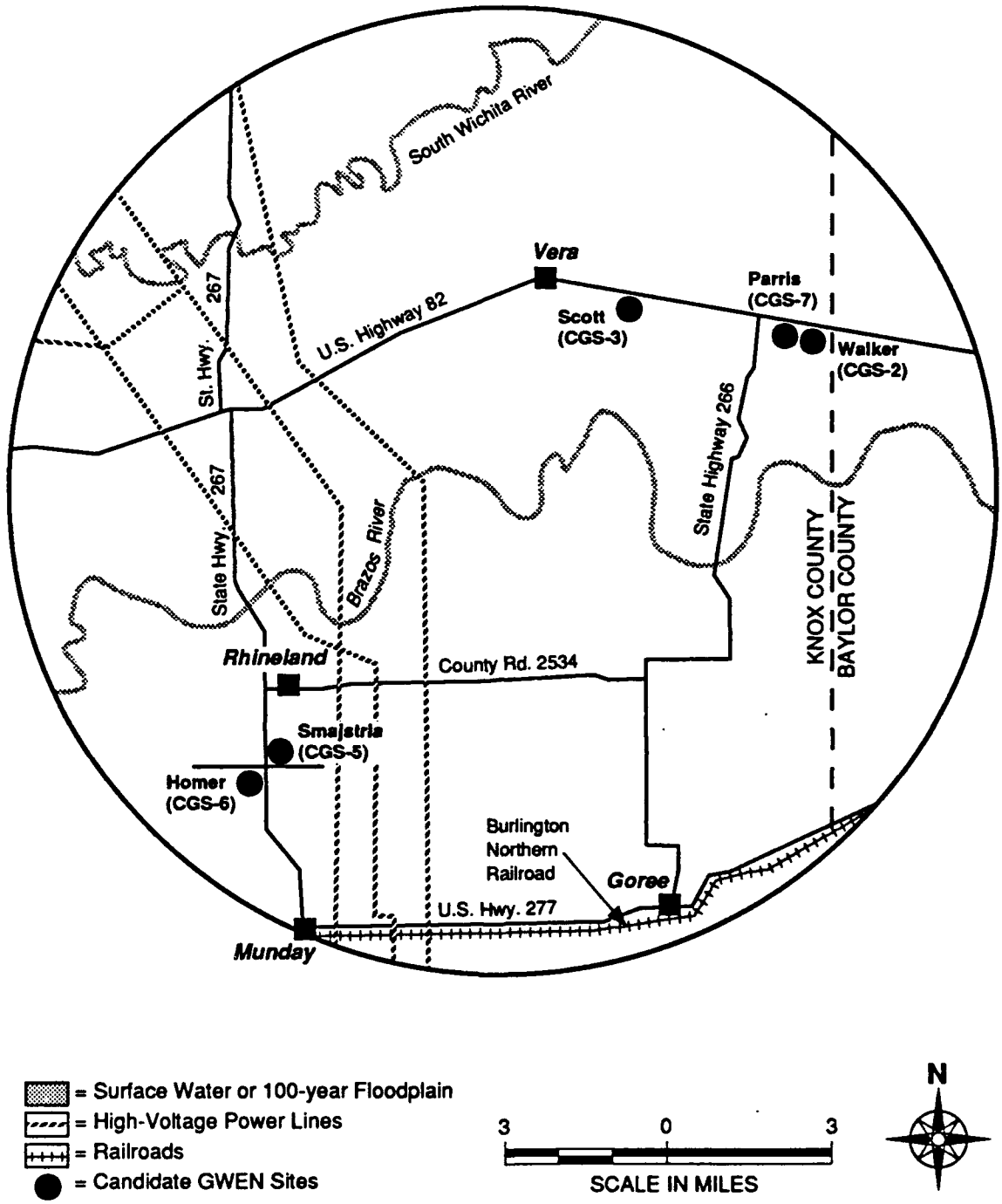


FIGURE 2.1 LOCATIONS OF CANDIDATE GWEN SITES (CGSs) RELATIVE TO SELECTED MAJOR FEATURES AND ROADS WITHIN THE NORTH CENTRAL TEXAS SITE SEARCH AREA

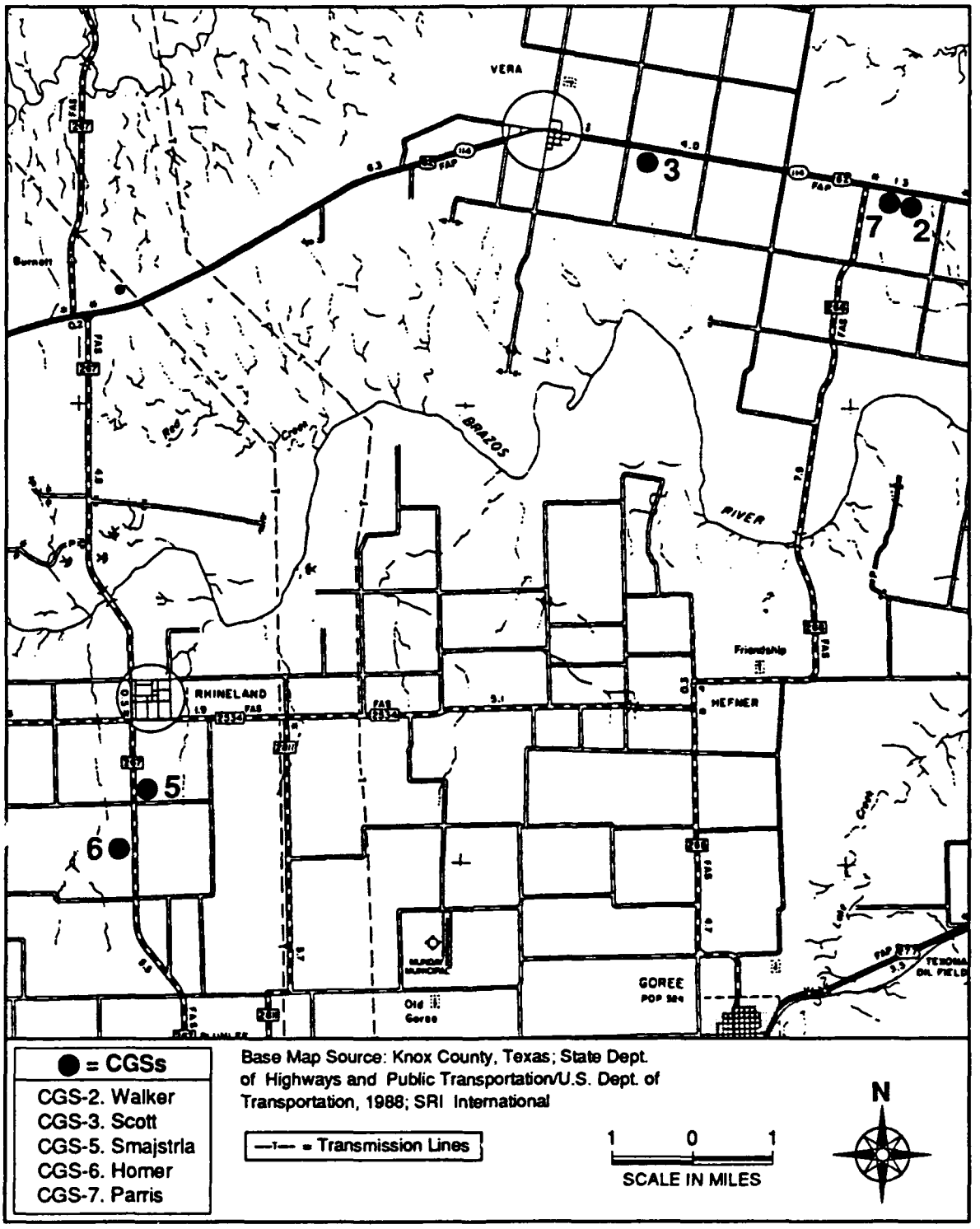


FIGURE 2.2 LOCATIONS OF CANDIDATE GWEN SITES (CGSs) IN KNOX COUNTY

Phase 2, regional screening, involved the application of exclusionary and evaluative criteria to the SSA to identify areas that might contain operationally acceptable sites outside environmentally sensitive areas. The resulting search areas, called potential areawide sites (PAWS), were submitted to appropriate federal, state, and local officials for review. The PAWS were then redefined, as appropriate, by incorporation of the comments of the reviewers, and a field investigation was conducted to find suitable candidate sites for a GWEN relay node within the redefined PAWS.

A field investigation for north central Texas was conducted in October 1989. Thirty-four sites were identified during automobile-based surveys as potential candidate GWEN sites (PCGSs). Attempts were made to contact the owners of the sites to determine their interest in selling or leasing land to the Government. Rights-of-entry were granted to investigate ten PCGSs. Following evaluation against the environmental siting criteria set forth in the FEIS, five of the ten PCGSs were recommended as CGSs for further review. All CGSs are located in Knox County.

Subsequent to the release of the PSER, three of the CGSs (Walker, CGS-2; Scott, CGS-3; Parris, CGS-7) were moved back 150 feet from the highway right-of-way to allow for future expansion of U.S. Highway 82. The analyses presented in this EA apply to the new site locations. Also subsequent to the PSER being issued, two CGS landowners withdrew two sites from consideration (Walker, CGS-2; Scott, CGS-3). These landowners are no longer interested in leasing or selling land to the Air Force. However, since the site-specific studies had been accomplished on these sites prior to the owners' withdrawal and because these sites continue to be considered viable alternatives, the Air Force has presented this data on the withdrawn sites in this EA.

Phase 3, individual site evaluation, of which this EA is a part, is then used to determine the relative suitability of the candidate sites through site-specific technical studies. This EA presents the results of the environmental portions of those studies and covers site-specific impacts associated with construction of a relay node in north central Texas. These are summarized in Sections 4.2 through 4.6 of this EA. The findings of this EA and site-specific studies of operational parameters will be used to select a preferred GWEN site (PGS).

2.1.2 Relay Node Construction and Operation

A typical relay node site is located on approximately 11 acres of land (see Figure 2.3 of this EA). It is an unmanned facility consisting of a 299-foot-tall, three-sided, 2-foot-wide LF transmitter tower, three equipment shelters, an access road, and associated fences. The tower has a base insulator and lightning protection and is supported by 24 guy wires, including 12 top-loading elements to further strengthen the signal and provide additional structural support.

These guy wires and top-loading elements are attached to the tower and 18 buried concrete anchors. The sizes of these anchors and their depth of burial varies with local soil and bedrock properties. However, the guy-wire anchors typically are rectangular blocks buried 5 feet below the surface. If bedrock occurs at or near the surface, the anchors are special rock-embedded rods. The tower base is concrete with a cross-section area resembling an inverted T. The size of this foundation is determined by soil conditions.

A radial ground plane, composed of 100 buried copper wires, extends out from the base of the tower. Each wire is 0.128 inch in diameter, about 330 feet long, and buried approximately 12 inches underground. The ground plane helps to strengthen the broadcast signal, and the number and length of the wires depend on the soil conductivity at the site. A 4-foot-high fence is installed around the perimeter of the ground plane to protect the ground plane and guy anchors and to prevent inadvertent exposure to electric shock resulting from the buildup of static electric charge.

In addition to the main tower, the relay node has two other antennas. One is an LF receive antenna made up of a pair of 4-foot-diameter rings mounted on a 10-foot pole. The second is an ultrahigh-frequency (UHF) antenna used for communicating with airborne input/output terminals. It is a 9-foot-high whip-like antenna mounted on a 30-foot-high pole. Both antennas are located within the equipment area at the perimeter of the site, which is enclosed by an 8-foot-high fence.

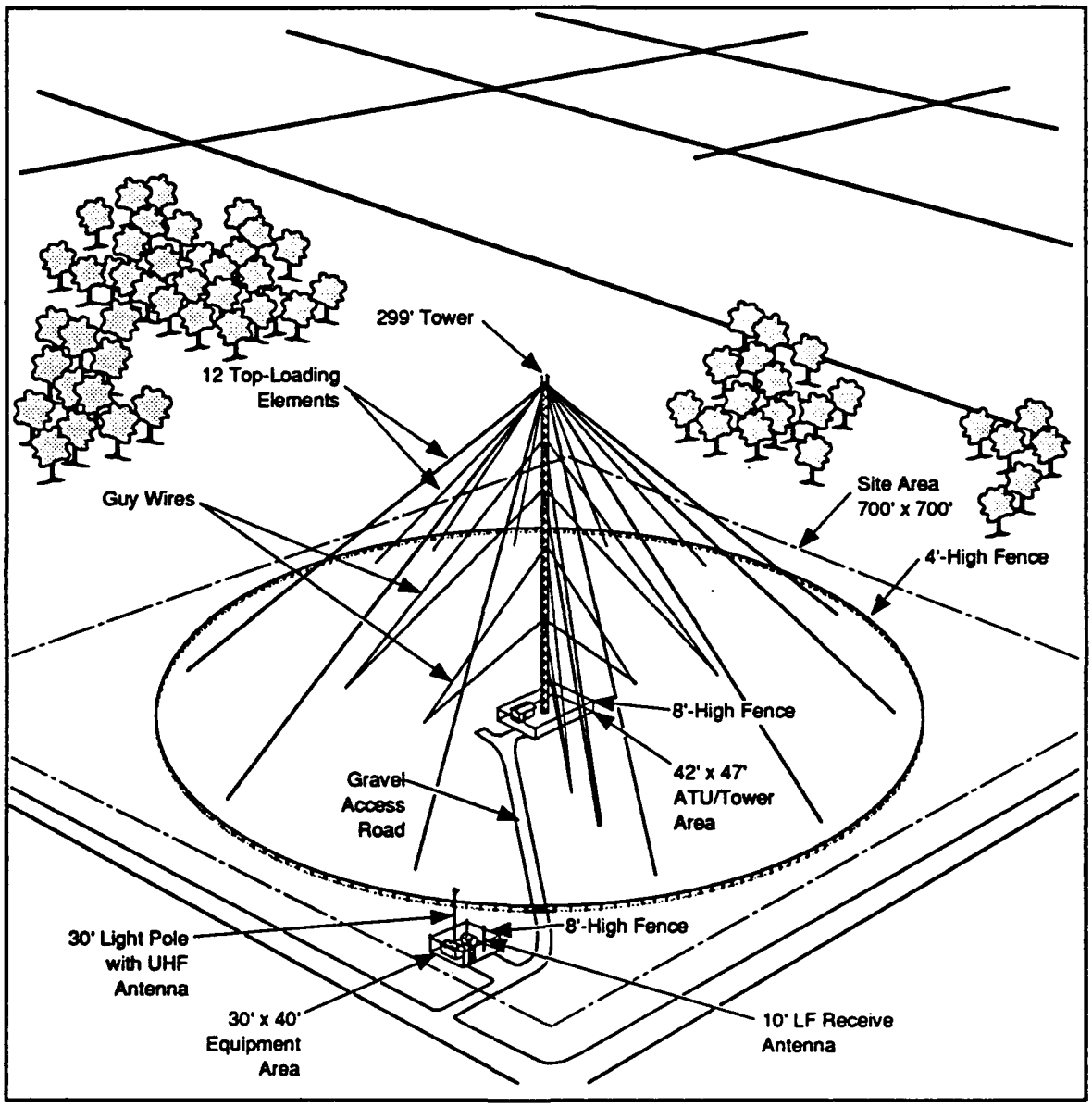


FIGURE 2.3 TYPICAL LAYOUT OF FOC RELAY NODE STATION

The siting and design of the tower are coordinated with the Federal Aviation Administration (FAA) to ensure compliance with FAA standards and regulations. The tower is equipped with a white strobe light at the top, which emits 40 flashes per minute and is rated at 20,000 candelas for daytime and twilight use and 2,000 candelas for nighttime use. To minimize glare at ground level, the light is focused upward and horizontally outward.

GWEN operates intermittently in the LF radio band at 150 to 175 kilohertz (kHz). For comparison, the low end of the AM band for commercial broadcasts is 530 kHz. The peak broadcast power for each GWEN tower is from 2,000 to 3,000 watts, depending on local soil conditions. In its ready status, GWEN typically transmits between 6 and 8 seconds per hour. GWEN does not interfere with commercial television, radio broadcasts, amateur radio operations, garage door openers, or pacemakers, as noted in Section 2.1.1.1, page 2-3 of the FEIS.

All equipment shelters are anchored to concrete pads. One shelter, located at the base of the tower, houses the antenna tuning unit (ATU). Two other shelters are located side by side in the equipment area enclosed at the perimeter of the property. One houses radio processing equipment, and the other houses a 70-horsepower, back-up diesel generator and two aboveground fuel tanks. The generator operates 2 hours per week for testing purposes and during power outages. Locked, 8-foot-high chain link fences topped with barbed wire secure the equipment shelter areas at the base of the tower and at the perimeter of the site to provide safety and to inhibit unauthorized entry. A 12-foot-wide gravel road provides access to the equipment area enclosure at the perimeter of the property. A 10-foot-wide gravel road leads from the equipment enclosure to the tower.

Fuel is stored in two aboveground steel tanks inside the generator shelter. Tank capacities are 559 gallons and 461 gallons. Each tank pipes fuel separately to the back-up power group (BUPG) and is equipped with two outlet shut-off valves, one controlled manually and one controlled automatically. If a leak occurs, fuel will flow into a floor drain leading to a tightly capped pipe extending outside the BUPG. Once approximately 2 gallons of fuel accumulate in the pipe, a "liquid spill" signal is sent to the GWEN Maintenance Notification Center, which will dispatch maintenance personnel. However, if a leak were not detected,

an explosion inside the shelter would be extremely unlikely due to the high flash point of diesel fuel. If a tank at the GWEN station failed, the entire contents of one tank could be released and contained inside the BUPG shelter. Refer to Section 4.12.1.1, beginning on page 4.12-1 of the FEIS for further discussion on diesel fuel spills and leaks.

The station uses existing commercial three-phase electric power and telephone service, but does not require water, septic, or sewer systems. Power and telephone service are brought to the site through either overhead or buried lines, depending on local utility practices. Power and telephone service are generally brought underground from the site boundary to the equipment shelter area.

Temporary increases in air pollutant emissions will occur during construction, primarily from greater use of heavy machinery than is required in normal farming operations. Emissions resulting from operations of the facility will be limited to the operation of the BUPG, which will operate only 2 hours every week for testing purposes and for additional periods as required during power outages. Thus, the generator will operate for a total of 152 hours per year, if commercial power outages totaled 48 hours. If the generator runs at 100 percent load during the projected 152-hour operating time, total emissions in one year will be less than 350 pounds per pollutant, as documented in Section 4.3.1, beginning on page 4.3-1 of the FEIS.

Noise levels generated by construction equipment are discussed in Section 4.5.1.1, beginning on page 4.5-1 of the FEIS. Under worst-case assumptions, levels could reach 78 dBA at the site boundary from on-site activity and 92 dBA at distances of 50 feet from equipment installing the off-site access road. Noise generated during GWEN operation would come from the BUPG, which will operate only 2 hours per week and during commercial power outages. The BUPG will be located at least 50 feet within the site boundary with its exhaust side oriented toward the tower area. Noise levels due to intermittent operation of the BUPG will be less than 72 dBA at the site boundary, which is within the standards typically set for lands under agricultural use (70 to 75 dBA). At 50 feet beyond the site boundary, the noise level would drop below 65 dBA, which is within the standards typically set for residential and mixed residential/agricultural use (55 to 65 dBA).

These noise levels and standards are discussed in Section 3.5 3, page 3.5-2, and Section 4.5.1, pages 4.5-1 through 4.5-6 of the FEIS.

Construction will require as many as 20 workers at any given time and take about 6 weeks. Standard earth-moving and erection equipment will be used, as detailed in Table 2-1, page 2-14 of the FEIS. Erosion control techniques that are consistent with local practices will be used during construction. No vegetation removal or grading at any of the sites will be required. The site will be replanted after construction is complete.

After construction is completed, personnel requirements will be limited to periodic maintenance by a contractor who will service the equipment, cut the surface growth, remove snow from the access road, and perform other services as needed. Security services will be arranged with local authorities. The projected life of the facility is 15 to 25 years. Upon decommissioning, the tower and other structures will be removed, as discussed in Section 2.1.4, page 2-18 of the FEIS.

2.2 Alternative 1: Walker Site (CGS-2)

The Walker site is located 175 feet from the paved edge of the south side of U.S. Highway 82 in the east 80 acres of the north 160 acres of Section 1, Block B, G.H.&H. Railroad Co. Survey. The site is 0.5 mile east of the intersection of U.S. Highway 82 and State Highway 266. It was moved 150 feet south from its original northern boundary to allow for the future expansion of U.S. Highway 82. The access road would be from U.S. Highway 82 and would be 175 feet long.

Three-phase power would be obtained from overhead lines 232 feet away, along the north side of U.S. Highway 82. Telephone lines would be connected to an underground cable on the south side of U.S. Highway 82, about 175 feet away.

Appendix B, Figure B.1 of this EA, provides a map showing the surrounding topography.

2.3 Alternative 2: Scott Site (CGS-3)

The Scott site is located 170 feet from the paved edge of the south side of U.S. Highway 82 in the east 100 acres of the west 140 acres of the northwest quarter of Section 64, Block B, G.H.&H. Railroad Co. Survey. The site is about 1.1 miles east of the town of Vera. It was moved 150 feet south from its original northern boundary to allow for the future expansion of U.S. Highway 82. The access road would be from U.S. Highway 82 and would be 170 feet long.

Three-phase power would be obtained from overhead lines along the north side of U.S. Highway 82, 232 feet away. Telephone lines would be connected to an underground cable on the south side of U.S. Highway 82, about 175 feet away.

Appendix B, Figure B.2 of this EA, provides a map showing the surrounding topography.

2.4 Alternative 3: Smajstrla Site (CGS-5)

The Smajstrla site is located 24 feet from the paved edge of the east side of State Highway 267 and on the north side of an unnamed road in the southwest corner of Lot 6 of the D.G. Burnett Survey 15, Abstract 18. The site is about 1.1 miles south of the town of Rhineland. The access road would be from State Highway 267 and would be 24 feet long.

Three-phase power would be obtained from overhead lines along the west side of State Highway 267, 60 feet away. Telephone lines would be connected to an underground cable adjacent to the western site boundary.

Appendix B, Figure B.3 of this EA, provides a map showing the surrounding topography.

2.5 Alternative 4: Homer Site (CGS-6)

The Homer site is located 24 feet from the paved edge of the west side of State Highway 267 and on the north side of the dirt access road leading to the Homer property in the southeast corner of Lot 1 of D.G. Burnett Survey 14, Certificate 8. The site is about 1.8

miles south of the town of Rhineland. The new access road to the site would be from State Highway 267 and would be 24 feet long.

Three-phase power would be obtained from overhead lines 60 feet away, at the intersection of State Highway 267 and another dirt road that begins at the northeast corner of the site. Telephone lines would be connected to an underground cable, 60 feet away along the east side of State Highway 267.

Appendix B, Figure B.4 of this EA, provides a map showing the surrounding topography.

2.6 Alternative 5: Parris Site (CGS-7)

The Parris site is located 175 feet from the paved edge of the south side of U.S. Highway 82 in the west half of the north half of the north half of Section 1, Block B, G.H.&H. Railroad Co. Survey. The site is about 1,200 feet east of the intersection of U.S. Highway 82 and State Highway 266. It was moved 150 feet south from its original northern boundary to allow for the future expansion of U.S. Highway 82. The access road would be from U.S. Highway 82 and would be 175 feet long.

Three-phase power would be obtained from overhead lines 232 feet away, along the north side of U.S. Highway 82. Telephone lines would be connected to an underground cable on the south side of U.S. Highway 82, about 175 feet away.

Appendix B, Figure B.5 of this EA, provides a map showing the surrounding topography.

2.7 No Action Alternative

The no action alternative is deletion of the north central Texas relay node from the GWEN network. Adoption of this alternative would mean a consequent degradation in the performance of the system due to a lack of connectivity to other nodes in the system.

3.0 AFFECTED ENVIRONMENT

This section discusses the environmental setting of the proposed GWEN project in north central Texas. Section 3.1 of this EA describes the general characteristics of the SSA, and Sections 3.2 through 3.6 of this EA describe the unique characteristics of each CGS within the SSA. Site descriptive data was obtained during field investigations conducted in October 1989. U.S. Geological Survey 7.5 minute topographical maps were used as data sources for distances, physiographic features, and topography (USGS, 1966a-d; 1967a-b; 1968a-b; 1981).

3.1 Site Search Area

Presented below is information on the physical, biological, and socio-cultural settings of the SSA.

3.1.1 Physical Setting

The SSA in north central Texas is a circular, 250-square-mile area in Knox and Baylor counties centered 3.6 miles south of the town of Vera, in the Southern Great Plains portion of the Central Lowlands physiographic province of the United States.

The SSA consists of an elevated level plain ranging from 1,350 to 1,500 feet above mean sea level. The Brazos and South Wichita rivers flow across the plain; they have cut river valleys up to 4 miles wide and from 100 to 200 feet below the elevation of the plain. Relatively steep escarpments, reaching up to 20 percent in gradient, form boundaries between these incised river valleys and the surrounding plain.

Much of the SSA is underlain by fossil-rich alluvial deposits known as the Seymour Formation. Dating from the Pleistocene age (2 to 0.01 million years ago), this formation ranges in thickness from 2 to 80 feet and contains a sequence of gravels, sands, silts, and clays that becomes finer in texture moving up the sequence (Hook, 1990a). A coarse basal component is overlain by finer-grained channel fill and minor floodplain deposits. In many places where the formation is exposed, caliche forms a resistant caprock. Volcanic

ash, known as Type 0 Pearlette ash, is spread widely throughout the Seymour Formation. The Seymour Formation is underlain by the Clear Fork Group, which is bedrock dating from the Early Permian age (286 to 258 million years ago). This bedrock is exposed in those areas not covered by the Seymour Formation (Hook, 1990a).

The area is seismically very stable, with a low level of seismic risk (Manitakos, 1989). There are no known active faults in the vicinity of the SSA. No earthquakes have been recorded in Texas within 70 miles of the SSA (Howard *et al.*, 1978; Kinney, 1966; Reagor *et al.*, 1988; Stover, 1986).

Mineral resources in the SSA consist of sand, gravel, gas, and oil (Garner, 1989; Rogers and Risinger, 1979). No known sand or gravel pits are located within any of the sites. Oil and gas are produced primarily in the southern half of the SSA (PIEMS, 1989a, 1989b; Rogers and Risinger, 1979). In April 1990, a representative of the Oil and Gas Division of the Railroad Commission of Texas conducted both a review of district records for known gas or oil deposits, and a physical inspection of each site. No known gas or oil deposits occur within any of the sites; however, active oil production was noted 0.25 mile southeast of the Homer site (CGS-6) (McNeel, 1990). In addition, gas and oil drilling rights at the Homer site have been leased for a 3-year period that will end in May 1992 (Ainsworth, 1990).

Paleontological sensitivity in the SSA is high. The Seymour Formation is an important source of information on Pleistocene terrestrial fauna that existed in a frost-free region. The older, coarser layers of the Seymour Formation contain a diversity of intermediate- to large-sized vertebrates. The silty to sandy layers contain fish, amphibians, mollusks, reptiles, birds, and small mammals. Only one specimen has been recovered from the top layer of the formation. Three local paleofaunas, two of which are wholly terrestrial, represent different ages and paleoecologic conditions and are known as the Gilliland, Patterson Ranch, and Vera local faunas. These assemblages appear to span nearly all of the middle Pleistocene epoch, 1.9 million to 0.45 million years ago. The presence of Type 0 Pearlette ash helps to date the fossils exceptionally well and gives them great value as sources of information about past biogeographic patterns. The mollusk and mammal remains, in particular, are a general indication of past climatic conditions (Hook, 1990a).

In March and April 1990, a survey was conducted by a paleontologist qualified in the State of Texas. The survey consisted of a literature review and records search for known paleontologic resources in the SSA, an analysis of water well data, and a field reconnaissance of the five CGSs. The literature search revealed 14 known fossil localities within the SSA (see Figure 3.1 of this EA), but no previously recorded paleontologic resources are located within any of the CGSs. In addition, data was analyzed from water wells in the vicinity to assess near-surface conditions and trends in soil thickness. Data from an inventory of 63 water well drillers' logs indicate that soil depths range from 2 to 21 feet. Soil at three CGSs (Walker, CGS-2; Scott, CGS-3; Parris, CGS-7) is reported to be 4 feet deep; soil at two CGSs (Smajstrla, CGS-5; Homer, CGS-6) is reported to be at least 5 feet deep (Hook, 1990b).

During the field reconnaissance of the five CGSs, no fossils were found. At the Walker (CGS-2), Scott (CGS-3), and Parris (CGS-7) sites, which were to be relocated, an area of 700 feet by 850 feet was surveyed to include the new location. Traverses were non-systematic because of the presence of crops or grazing livestock. To corroborate the water well data, soils on each CGS were probed 7 to 15 times with a steel rod at randomly selected locations, to an approximate depth of 4 feet. No areas of thin soil cover were found during the survey, and no resistant clasts were encountered in the shallow subsurface. Soil thickness at all sites appears to be greater than the 4-foot probe; the fossil-bearing rocks are at least beneath that depth of the soil (Hook, 1990b).

The soils of the SSA were formed in alluvium or derived from shales, sandstone, gypsum, and wind deposits. The soil series represented at the CGSs are Miles, Rotan, Altus, and Winters. Miles and Rotan soils are noncalcareous, loamy soils with level to gentle slopes. The Altus series is a nearly level soil consisting of fine sandy and sandy clay loams. The Winters series is also a nearly level soil consisting of fine sandy and sandy clay loams, and sandy clay. All are deep, well-drained soils located on uplands (Rogers and Risinger, 1979).

Soil acidity on the CGSs generally ranges from neutral to moderately alkaline, with a pH range of 6.6 to 8.4, although the Altus soils on the Homer site (CGS-6) range from

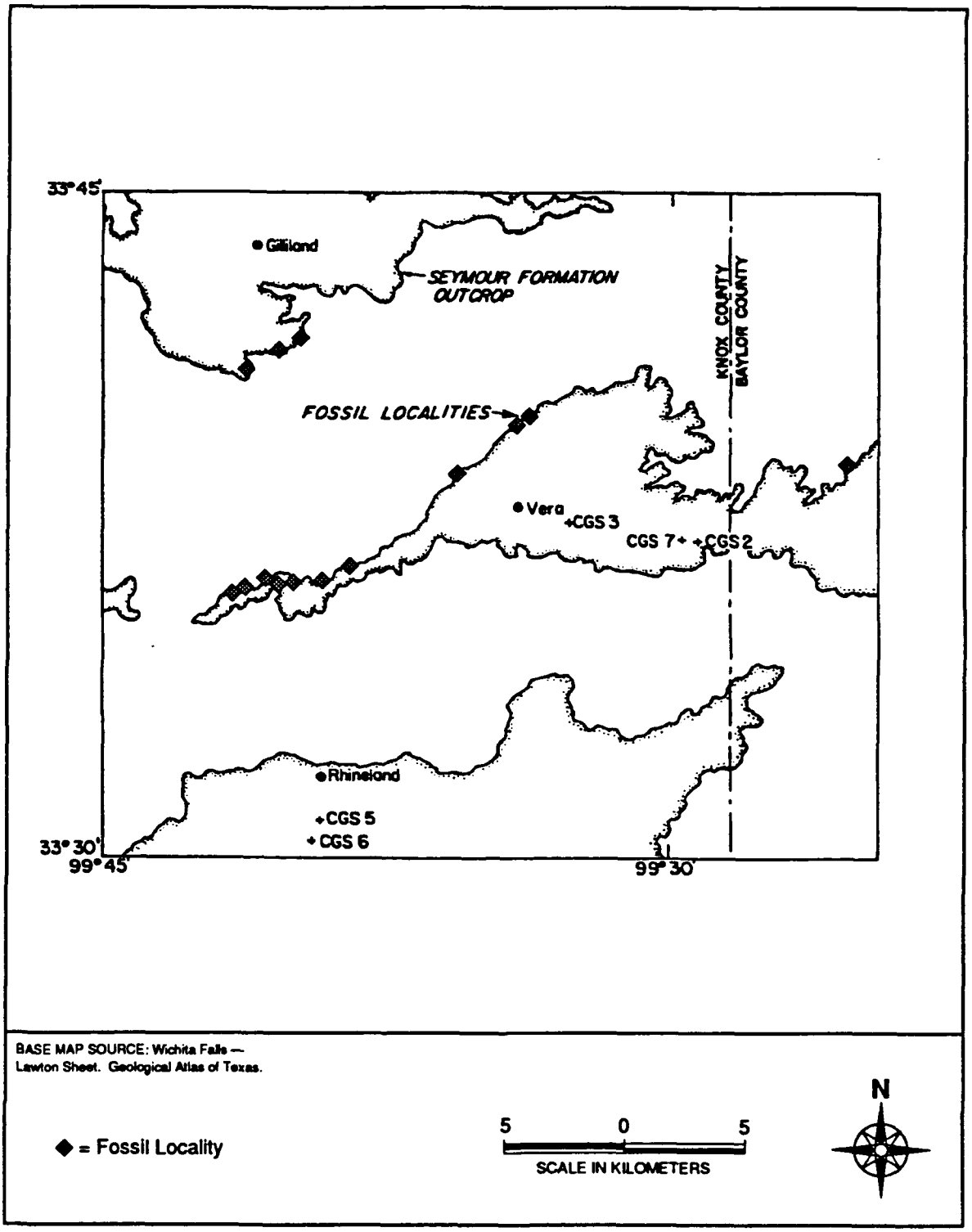


FIGURE 3.1 PUBLISHED FOSSIL LOCALITIES IN THE SEYMOUR FORMATION, NORTHEASTERN KNOX AND NORTHWESTERN BAYLOR COUNTIES, TEXAS. (HOOK, 1990a.)

slightly acid to neutral (pH 6.1 to 7.3). The water erosion hazard is slight to moderate. The wind erosion hazard can be severe in the Miles series if the soil is bare (Rogers and Risinger, 1979). Two of the CGSs (Scott, CGS-3; Homer, CGS-6) have soils that are designated prime farmland; the other three CGSs have soils that are designated prime farmland if irrigated (Connors, 1990; SCS, 1981). None of the sites is irrigated (Homer, 1991; Scott, 1991; Smajstrla, 1991). The depth to the seasonally high water table is greater than 6 feet (Rogers and Risinger, 1979). None of the soils is hydric (SCS, 1987). The specific soils on each CGS are discussed in Sections 3.2 to 3.6 of this EA.

The SSA is in the Red River and the Brazos River drainage basins (Davenport, 1990). The central and southern portions of the SSA drain southward into the Brazos River (Jones, 1990; Sims, 1989). The northern portion of the SSA drains northward into the South Wichita River, which eventually joins the Red River to the east of the SSA (Rogers *et al.*,1976). Flood Hazard Boundary Maps for the region do not exist; however, none of the CGSs is within a 100-year floodplain according to the Soil Conservation Service (Jones, 1990). Areas subject to flooding occur primarily along the Brazos and South Wichita rivers. The duration of flooding lasts from less than 2 days to 7 days maximum (Jones, 1990; Rogers and Risinger, 1979).

In areas where surface runoff is rapid, terraces or grassed waterways have been constructed to facilitate absorption into the soil, or to channel runoff to outlets and streams (Rogers and Risinger, 1979). All streams are intermittent. Within the SSA, the primary tributary of the South Wichita River is Soap Creek; the primary tributaries of the Brazos River are Lake, Dutchman, and Red creeks. The river valleys and scrubland contain small lakes and stock ponds for watering cattle. The distances from each CGS to the nearest surface water or wetlands are given in Sections 3.2 through 3.6 of this EA.

Fresh groundwater in the area is obtained in large quantity from the Seymour Aquifer, an important water-bearing unit in the Seymour Formation. Most municipal, domestic, and stock supplies, as well as over 2,000 irrigation wells, are dependent on the aquifer. Although seeps and springs are located along the edge of the formation, natural discharge occurs primarily through evapotranspiration by plants. Recharge occurs primarily from direct infiltration of precipitation at the land surface (Harden and Associates, 1978).

The South Wichita River has a moderately high level of dissolved solids, which makes it unsuitable for drinking purposes, and the Brazos River has rare instances of elevated levels of coliform bacteria. Copper concentrations in the Brazos or South Wichita rivers are not included in the Texas Water Commission's 1988 State of Texas Water Quality Inventory; however, there are no violations of those standards that are measured, and surface water quality in the SSA is generally good and meets state standards (Bayer, 1990). Groundwater quality varies but is normally satisfactory for irrigation. The State of Texas does not have standards for groundwater (Bayer, 1990); however, water from the Seymour Aquifer meets the state standards for public supplies, except for nitrate content which commonly exceeds the limit (Harden and Associates, 1978).

The climate of Knox and Baylor counties is characterized as subtropical with cold, dry winters and hot, humid summers (Rogers *et al.*, 1976; Rogers and Risinger, 1979). Average monthly temperatures range from about 42° F in January to about 85° F in July (Harden and Associates, 1978; Rogers *et al.*, 1976). Average annual precipitation at Munday, Knox County, is 24.7 inches; in Seymour, Baylor County, it is 26.2 inches. Thundershowers between April and October account for 75 percent of these averages. The growing season is from April to November, lasting 217 days in Knox County and 214 days in Baylor County (Harden and Associates, 1978; Rogers *et al.*, 1976; Rogers and Risinger, 1979).

Air quality in Knox and Baylor counties is classified as in attainment of the National Primary and Secondary Ambient Air Quality Standards for sulphur dioxide, nitrogen dioxide, carbon monoxide, and particulates. Although no actual air quality measurements are made within the counties, the Texas Air Control Board bases this estimate on the low population densities and relatively few cars in Knox and Baylor counties. Further, the SSA is not in any large metropolitan area plume, so there is no long-range transport of ozone into the area (Butts, 1990). Air quality standards are discussed in Section 3.3.3, pages 3.3-1 to 3.3-7 of the FEIS.

3.1.2 Biological Setting

The SSA lies within the plains grasslands ecosystem of the Southern Great Plains (Garrison *et al.*, 1977). The native plant community is composed primarily of short to medium tall grasses, shrubs, and forbs. Characteristic vegetation species include mesquite, buffalo grass, blue grama, western wheatgrass, sideoats grama, little bluestem, Indian grass, sand bluestem, tobosa, silver bluestem, switch grass, and plains bristlegrass. The native vegetation in the area has been largely replaced by cultivated farmlands and ranches. The area has been heavily grazed for several generations in support of beef cattle operations; the result is an infestation of mesquite and lotebush in the uplands and mesquite and saltcedar in the river valleys (Rogers and Risinger, 1979). Some areas, however, retain vegetation similar to the original plant communities. There are no natural plant communities on any of the candidate sites.

Common animals in the region, both game and nongame species, include white-tailed deer, turkeys, ducks, cottontail rabbits, jackrabbits, coyotes, raccoons, badgers, and bobwhite quail (Cloud, 1990; Rogers and Risinger, 1979; Appendix C, Short, 1989, pages C-4 and C-5 of this EA). Large numbers of deer and turkey inhabit the riparian areas and brushlands along the rivers (Appendix C, Short, 1989, pages C-4 and C-5 of this EA). There are numerous songbirds including mockingbirds, doves, killdeer, and meadowlarks, and raptors such as red-tailed hawks (Cloud, 1990; Rogers and Risinger, 1979). The rivers support a variety of fish including the channel catfish, carp, buffalofish, common shiner and minnow, sunfish, and crappie. Black bass and largemouth bass are commonly found in the South Wichita River (Cloud, 1990).

The SSA lies within the Central Flyway of North America (Sims, 1989). A large but unknown number of waterfowl, including Canada geese, sandhill cranes, and a variety of ducks migrate through the area in the spring and fall. Areas of high waterfowl use are confined to the Brazos River, which provides important resting and roosting habitat, and the nearby grainfields which are used for foraging (Appendix C, Short, 1989, pages C-4 and C-5 of this EA).

The *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (GPO 1989-236-985/00336) states that an area must meet three criteria to be designated as wetland: hydric soils; hydrophytic vegetation; and wetlands hydrology, which includes a shallow water table and standing water for at least 7 days of the growing season (FICWD, 1989). This manual was used as the basis for wetland determination. No wetlands mapping exists for the region. However, consultation with the U.S. Fish and Wildlife Service (USFWS) indicated that very few wetlands are present in the SSA (Cloud, 1989a). Based on field investigations (Nishida, 1989), biological data provided by the USFWS (Cloud, 1989a), and soils data (Rogers and Risinger, 1979; SCS, 1987), none of the CGSs examined as part of this EA meets these three criteria, nor do the areas within 300 feet of the CGSs.

Riparian growth, which provides habitat for a variety of wildlife, occurs along the Brazos and South Wichita rivers (Appendix C, Short, 1989, pages C-4 and C-5 of this EA). The Brazos River is over a mile from the closest CGS and the South Wichita River is over 4 miles from the closest CGS. No hydrophytic vegetation was observed at the sites during the field investigations (Nishida, 1989).

In compliance with Section 7 of the Endangered Species Act of 1973, as amended (16 United States Code [USC] 1531, *et seq.*, at 1536), a list of threatened and endangered species was requested during informal consultation with the USFWS (Appendix C, Short, 1989 and 1992, pages C-4 to C-5 and pages C-19 and C-20 of this EA). The USFWS determined that the SSA was within the migratory corridor of the whooping crane (*Grus americana*), which is listed as endangered by the USFWS (Appendix C, Short, 1989, pages C-4 and C-5 of this EA) (see Figure 3.2 of this EA).

Whooping cranes exist on a diet of reptiles, amphibians, insects, grains, and aquatic plants (Ransom, 1981). Whooping crane roost sites tend to be isolated, shallow open water bodies that have a minimal amount of vegetation to block the crane's view and a depth of water no more than 30 centimeters. The whooping crane prefers roost sites 300 to 2,400 feet from man-made structures and other disturbances, depending on the type of disturbance (Armbruster, 1990). This habitat does not exist on any CGS, as no surface water of any kind occurs within 400 feet of any CGS. Most whooping crane flights are east

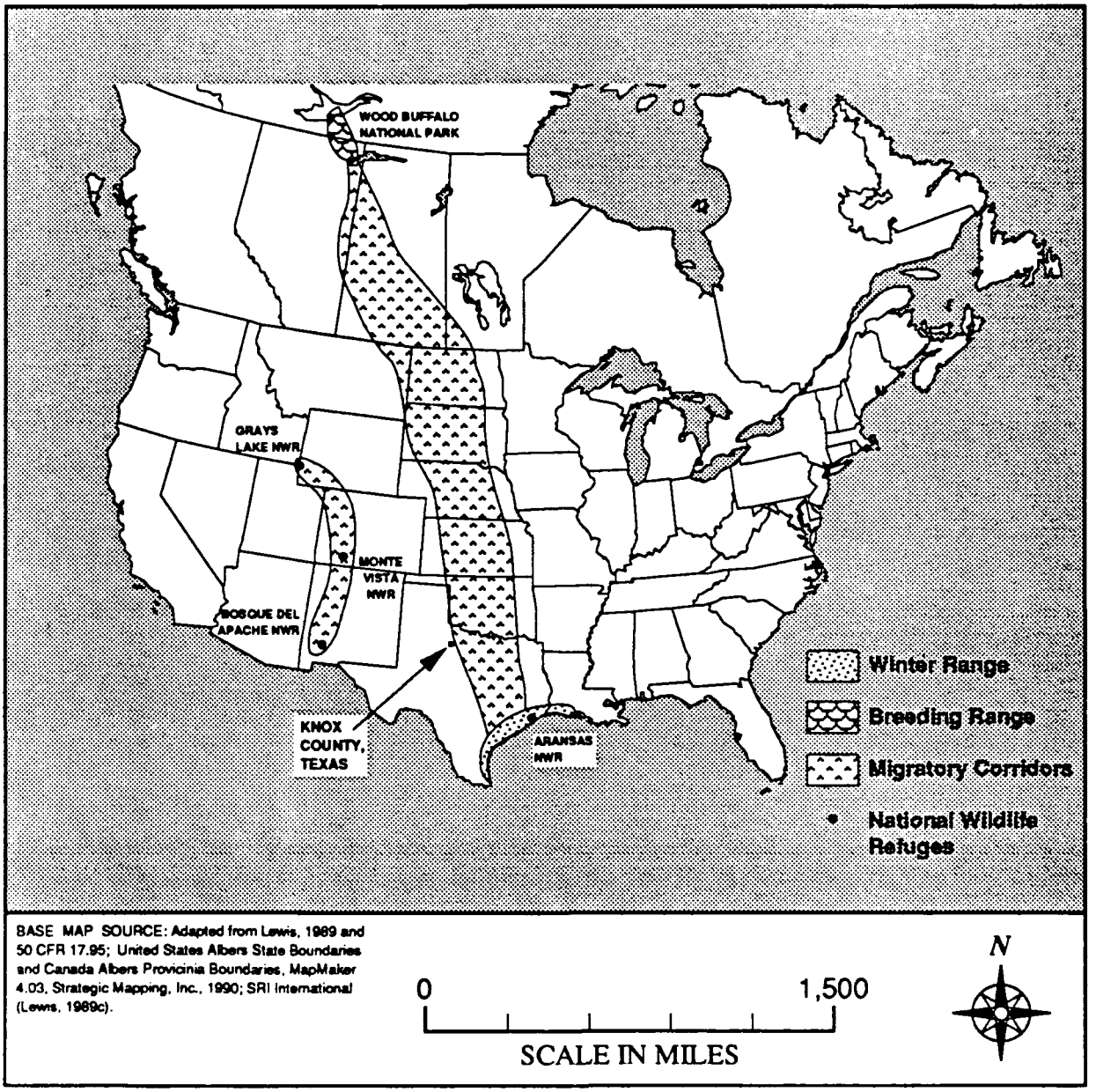


FIGURE 3.2 PRESENT RANGE OF THE WHOOPING CRANE

of the CGSs. No whooping cranes have been sighted in the area as of July 1991 (Jobman, 1991). Approximately 140 to 145 cranes of the Wood Buffalo National Park-Aransas National Wildlife population use this corridor during their annual migrations (Lewis, 1989a, 1989b). In subsequent consultation, the USFWS stated that no threatened or endangered plant or animal species were likely to use the CGSs and they expressed no environmental concerns with the project (Appendix C, Short, 1990 and 1992, pages C-6, C-19 and C-20 of this EA).

The Texas Parks and Wildlife Department (TPWD) identified the black-capped vireo (*Vireo atricapillus*) as one other federally-endangered species potentially occurring in the SSA (Sullivan, 1989a, 1989b). This bird species requires a habitat of oak-juniper woodland combined with a shrub layer extending up to 6 feet, and open grassy spaces separating the trees and shrubs. A TPWD representative visited the candidate sites in October 1989 and confirmed that this habitat does not occur at or near any of the CGSs (Sims, 1989).

Texas state-listed species or species of concern potentially occurring in the area are the Texas kangaroo rat (*Dipodomys elator*), palo duro mouse (*Peromyscus truei comanche*), smalleye shiner (*Notropis buccula*), and the sharpnose shiner (*Notropis oxyrhynchus*) (Sullivan, 1989a, 1989b). No state-listed rare or endangered plant species have been recorded in Knox County (Sullivan, 1991).

The Texas kangaroo rat is a state-threatened species that requires a habitat of clay soils and mesquite or other small shrubs under which to burrow (Wahl, 1989). All mapped occurrences of the rat are outside the SSA; however, the SSA contains the type of habitat predictive of its presence (Sullivan, 1989b; Wahl, 1989). During site visits, a representative of TPWD confirmed the absence of small mesquite at any of the CGSs (Sims, 1989). In April 1990, a zoologist with the TPWD Natural Heritage Program reviewed soil types and land-use patterns of the CGSs and concluded that the Texas kangaroo rat would not occur at any of the CGSs or in the CGSs' associated road and power line rights-of-way (Sullivan, 1990; Wahl, 1990). The palo duro mouse, a state-threatened species, occurs in what is locally known as "breaks country," that is, broken terrain found along river drainages and rocky areas (Sullivan, 1989a, 1989b). All CGSs are sited away from breaks country.

Two fish, the smalleye shiner, a state-imperiled species, and the sharpnose shiner, a rare species, historically occurred in the South Wichita and Brazos rivers in Knox and Baylor counties. The smalleye shiner was last observed in 1984, and the sharpnose shiner in 1954 (Sullivan, 1989a, 1989b).

3.1.3 Socio-Cultural Setting

The western area of northern Texas underwent numerous occupations in prehistory. Temporally diagnostic artifacts date the earliest occupations to the Late Pleistocene, approximately 11,500 to 7,500 years ago, when small bands composed of several families hunted megafauna such as bison and mammoth. Gradually, from about 7,500 to 1,200 years ago, subsistence patterns changed. Dependence on wild plants and small game grew, and seasonal occupation of small campsites became evident. Between A.D. 1200 and the time of European contact, the first evidence of domestic agriculture appeared along with the establishment of semi-permanent or permanent village sites, the development of regional social structures, and the appearance of the bow and arrow and ceramics (Voellinger, 1990).

European contact with indigenous populations in Texas began with Spanish exploration of the area. The Spanish explorer, Narvaez, led the first expedition in 1528. By the mid-18th century, trading with indigenous groups had been established by the French, and the Spanish had constructed a presidio and a mission near the mouth of the Trinity River. French trappers and traders encountered members of the Caddo confederacy, a military alliance of related tribes. Although direct evidence is lacking, Wichita Native American groups are thought to have inhabited the area in historic times. Originally from present-day central Kansas, the Wichita tribe moved south to the Red River. Several Wichita subgroups subsequently moved farther south and may have frequented the SSA. Diseases introduced by Europeans reduced the Native American populations, and remnants of the Alabama and Coushatta tribes from the southeastern United States moved into the area in the early 1800s (Foster and Voellinger, 1991).

Early Euro-American settlement of the area was the result of a series of land grants issued by the Republic and later the State of Texas during the 1800s. By the mid-19th century, early pioneers were establishing cattle ranches and permanent settlements in Knox County. Later settlement patterns followed the acquisition of land by various railroad companies; the companies sold alternate land sections to stimulate development and establish a clientele along the route of the anticipated railway. By the late 19th century, immigrants began arriving and settling among the pre-established communities. By the turn of the century, townsites such as Vera and Rhineland, which began as dispersed collections of rural domestic farmsteads centered about a local church, were becoming centers of community, educational, and economic activity (Foster and Voellinger, 1991).

The completion of the Wichita Valley Railroad and the Kansas, Mexico, and Orient Railroad in the early 20th century has been cited as causing a dramatic population increase in Knox County by 1910. During that time, the local population expanded its family farms and ranches. The increasing use of automobiles and the construction of a local road system in the 1930s caused increasing commercial and residential development along the modern highways in towns like Vera. Rhineland, being a more remote community, does not exhibit a similar orientation. The mid-20th century was the greatest period of agricultural productivity for the area, although by the 1960s the decline in the price of cotton produced a similar economic decline in the area. As a result, most farming is now done by large-scale agribusiness operators who lease much of their land from individual landowners (Foster and Voellinger, 1991).

The Texas State Historic Preservation Officer (SHPO) was consulted, as required by the National Historic Preservation Act (16 USC 470, *et seq.*). The Texas SHPO stated that a 1985 survey revealed no prehistoric or historic sites on the CGSs, although buried archaeological resources might occur in the project area (Appendix C, Bruseth, 1990, page C-7 of this EA). Therefore a Phase I archaeological survey was conducted to determine if any archaeological resources were present on the CGSs. The survey consisted of a records and literature review of archaeological resources within the SSA. The review revealed no recorded landmarks in the State Archaeological Landmarks registry. Further research at the Texas Archaeological Research Laboratory revealed 88

previously recorded archaeological sites in Knox County, and eight in Baylor County, none of which is within 1.5 miles of any CGS (Voellinger, 1990).

In March 1990 an on-site archaeological survey of each CGS and its associated access road and power line right-of-way was conducted by an archaeologist qualified in the State of Texas walking linear passes at 65-foot (20-meter) intervals and shovel testing in areas of high probability. No cultural remains were discovered on the surface or through shovel tests at any of the sites, associated access roads, and power line rights-of-way (Voellinger, 1990).

In subsequent consultations, the Texas SHPO indicated that the communities of Vera and Rhineland might contain unidentified historic resources and recommended further survey work (Appendix C, Steely, 1990, pages C-9 and C-10 of this EA). Therefore, a survey was undertaken consisting of a literature and records search and a field survey of historic structures within 1.5 miles of the CGSs (Foster and Voellinger, 1991).

The literature and records search revealed that there are no historic properties in Knox or Baylor counties listed or formally eligible for listing on the National Register of Historic Places (NRHP) or in the State Archaeological Landmarks registry. The *Guide of Official Texas Historical Markers*, a handbook of recorded state historic landmarks and markers, lists seven sites in Knox County and eight sites in Baylor County, none of which is within 1.5 miles of any CGS (Foster and Voellinger, 1991).

For reasons discussed in Section 4.8.1.3, beginning on page 4.8-2 of the FEIS and Section 4.1.3 of this EA, historic structures within a 1.5-mile radius are potentially subject to adverse visual impacts from the relay node facility. In September and October of 1990, a field survey of historic structures was undertaken to identify potentially eligible structures within a 1.5 mile radius of the five CGSs. The survey identified four properties and one historic district that are potentially eligible for listing on the NRHP within 1.5 miles of four CGSs: the A. E. Boyd Ranch, within 1.5 miles of both the Walker (CGS-2) and Parris (CGS-7) sites; the Gray Homestead, Blacksmith Shop, and Dr. Henderson House, within 1.5 miles of the Scott (CGS-3) site; and the Rhineland historic district within 1.5 miles of the Smajstrla (CGS-5) site. No historic properties were identified within 1.5 miles of the

Homer site (CGS-6) (Foster and Voellinger, 1991). Details of these properties are discussed in Sections 3.2, 3.3, 3.4 and 3.6 of this EA.

In compliance with the American Indian Religious Freedom Act of 1978 (42 USC 1996), the Bureau of Indian Affairs (BIA) and the Texas SHPO were consulted in order to locate tribes associated with the project area (Bruseth, 1989; Oheltoint, 1989; Sutherland, 1992). Based on their recommendations and on the archaeological survey (Foster and Voellinger, 1991; Voellinger, 1990), six Native American tribal organizations were contacted: the Kickapoo Traditional Tribe of Texas, the Alabama-Coushatta Tribal Office, the Apache Tribal Office, the Comanche Tribal Office, the Kiowa Tribal Office, and the Wichita Tribe. These groups were contacted by letter and again by telephone, the GWEN project was explained, and information was requested on the presence and location of any known traditional, religious, or sacred sites that could be affected by construction of the tower. Representatives of the Alabama-Coushatta Tribal Office, the Apache Tribal Office, and the Kickapoo Traditional Council indicated no concerns (Batisse, 1991; Pewenoskit, 1991; Appendix C, Sailors, 1989, page C-18 of this EA). No other responses have been received.

Land use in the area is predominantly agricultural, with cultivated crops and rangeland accounting for 98 percent of the land in Knox County and 96 percent in Baylor County. Cotton, wheat, and grain sorghum are the primary cultivated crops. Calf raising is the main type of ranching in Knox County; steer feed-lot operations are the primary livestock enterprise in Baylor County (Rogers *et al.*, 1976; Rogers and Risinger, 1979). The area containing the CGSs is rural and is not zoned by Knox County (Brown, 1992).

Sources of ambient noise are limited primarily to the operation of farm equipment and traffic. As described in Section 3.5.3, beginning on page 3.5-1 of the FEIS, local ordinances generally set maximum noise level limits at 70 to 75 dBA for land under agricultural use; however, Knox County does not have a local noise ordinance (Perdue, 1991).

In 1980, the population of Knox County was 5,329, and the 1989 estimated population was 5,119. In Baylor County, a similar decrease in population occurred with 4,919 residents

recorded in 1980 and an estimated 4,418 in 1989. The SSA contains the towns of Munday and Goree, and the small, rural towns of Vera and Rhineland. The largest town, Munday, had an estimated population of 1,970 in 1989. Outside of these major settlements, the area is sparsely populated (NPDC, 1989).

The primary economic activities in the SSA include agriculture, gas and oil production, and livestock production. The 1989 estimated per capita income was $8,987 in Knox County and $9,531 in Baylor County. The 1988 unemployment rate was 4.87 percent in Knox County and 4.18 percent in Baylor County (BLS, 1988).

The transportation system is a network of one- and two-laned paved, gravel, and dirt roads. U.S. Highway 82 travels east-west, midway between the South Wichita and Brazos rivers, and U.S. Highway 277 travels east-west at the southern border of the SSA. State Highway 267 enters the SSA at the southern border west of Munday and travels north through the SSA. State Highway 266 begins in the town of Goree at the southern border of the SSA and travels north, connecting with U.S. Highway 82. The Burlington Northern Railroad crosses the SSA at the southern border; Munday Municipal Airport is located northeast of Munday, 3.5 miles from the closest CGS (CGS-6).

Recreational resources within the area are located primarily within town limits. A roadside park is in the far western portion of the SSA off U.S. Highway 82 in an area called The Narrows. Current development includes a full-service rest stop 6 miles east of the town of Benjamin in Knox County, and a golf course 2 miles east of Munday (Fitzgerald, 1989); all areas are more than 4.5 miles from the nearest CGS.

The visual setting is rural in character. The topography is level to gently sloping, except in areas where steep escarpments have formed between the incised river valleys and surrounding plain. The upland areas consist of simple geometric patterns created by the local road network and the cultivated fields delimited by fencerows of perennial forbs, shrubs, and grasses. Except for views that include towns, the complexity of the skyline is generally low, as defined in Section 4.8.1.3, page 4.8-10 of the FEIS. Farmsteads and their associated windbreaks or shade trees, gas and oil wells, occasional water towers, grain elevators, silos, windmills, and telephone and electric poles provide vertical contrast

to the otherwise level aspect of the uplands. The river valleys and area surrounding Lake Creek consist primarily of high density scrub interspersed with small strips of wooded areas.

3.2 Alternative 1: Walker Site (CGS-2)

The Walker site has a maximum 2 percent slope. The soil is composed of Miles fine sandy loam, which is moderately susceptible to water erosion and soil blowing. It is a deep, well-drained soil, with no flooding hazards. This series has a moderate infiltration rate when totally wet and a moderate rate of water transmission. Acidity is neutral to moderately alkaline, with pH values ranging from 6.6 to 8.4; shrink-swell potential is low. Depth to the seasonally high water table is greater than 6 feet (Rogers and Risinger, 1979). This soil series is classified as prime farmland if irrigated (Connors, 1990), and is not hydric (SCS, 1987). The site is not irrigated (Scott, 1991).

Drainage is to the southeast and southwest, with runoff eventually reaching the Brazos River, approximately 1.5 miles to the south. The nearest surface water is an intermittent stream 430 feet south of the site.

The site was planted in wheat during the field investigations. Weedy vegetation borders the periphery of the site. A small wooded area composed of mature mesquite and soapberry trees is approximately 450 feet from the southern boundary. The area has low deer density, but deer could come out of the woods and feed at night. The strip of woods is not considered a critical wildlife habitat because it is surrounded by fields, and deer could not use it as a travel corridor or escape route (Cloud, 1989b; Sims, 1989). Sandhill cranes occasionally use the field to forage (Scott, 1989).

The historic structures survey identified one property that is potentially eligible for the NRHP within 1.5 miles of this site. The A. E. Boyd Ranch, whose main residence is located 1.3 miles northwest of the CGS (see Figure 3.3 of this EA), is potentially eligible because it reflects the historic transition from domestic to commercial-scale agriculture as well as typical architectural developments in the area during the first half of the twentieth century. It is an extensive farm and ranch complex composed of 15 standing structures.

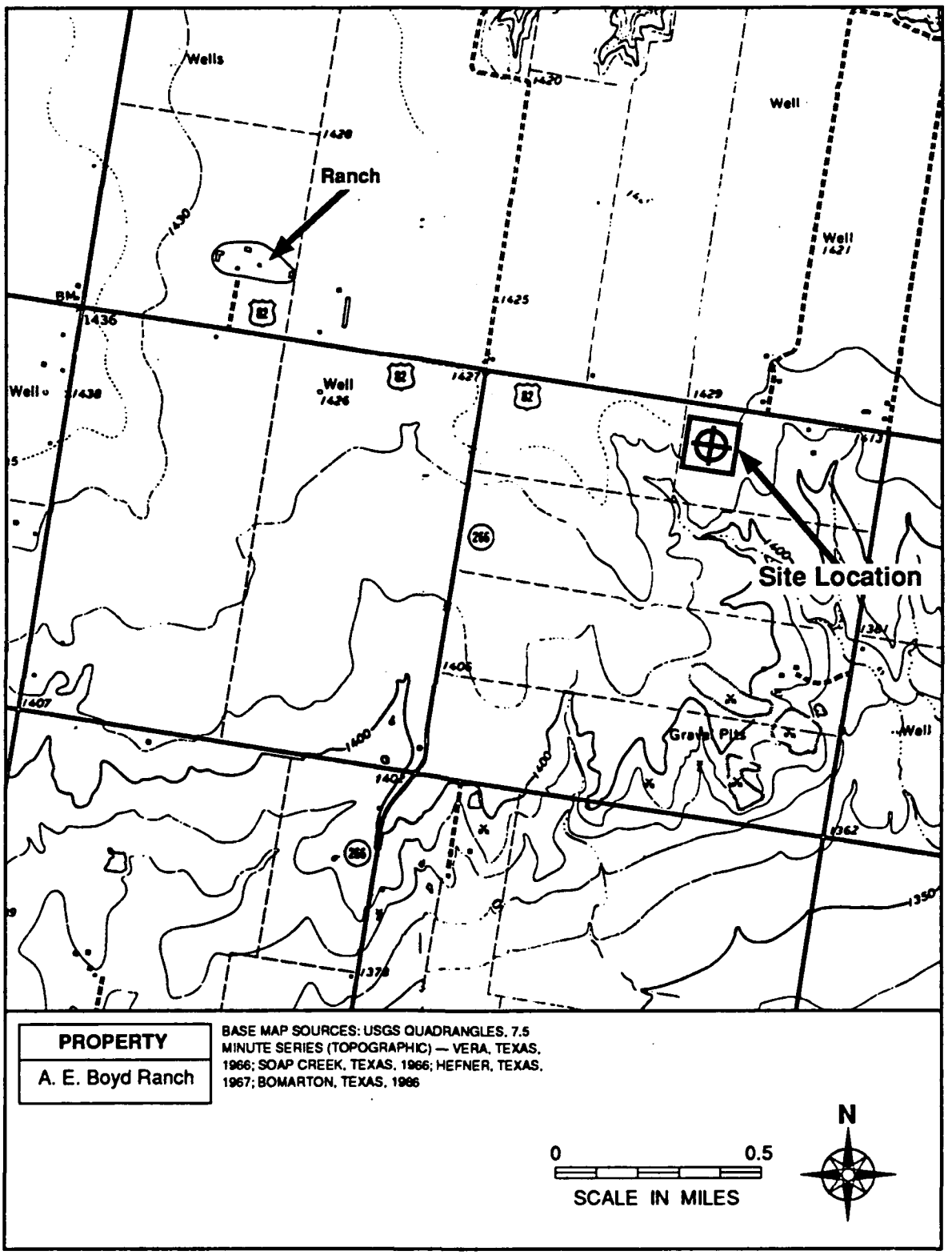


FIGURE 3.3 LOCATION OF PROPERTY THAT IS POTENTIALLY ELIGIBLE FOR LISTING ON THE NATIONAL REGISTER OF HISTORIC PLACES WITHIN 1.5 MILES OF THE WALKER SITE (CGS-2)

The core of this property is the main residence, an irregular Spanish Eclectic-style ranch house that is unique to the area, and the main barn associated with it. Most of the buildings on this property date to the 1920s, although the house was built during the 1930s. As one of the most prominent agricultural sites remaining in the area, its historic association is characterized by the relationship of the individual elements to one another and to their surroundings (Foster and Voellinger, 1991). Therefore, the setting of this property is important to its eligibility.

The communities of Red Springs and Vera are 4.2 miles east and 4.3 miles west of the site, respectively. A large grain elevator complex, consisting of three tall grain elevators and associated buildings, is located 0.9 mile west of the CGS.

3.3 Alternative 2: Scott Site (CGS-3)

The Scott site is a level field composed of the Rotan-Winters-Miles soil complex, which is slightly susceptible to water erosion. Acidity is neutral to moderately alkaline, ranging in pH from 6.6 to 8.4. The Winters and Miles series are moderately susceptible to soil blowing. Soils are deep and well-drained with no flooding hazards. Rotan and Winters series have slow infiltration rates when totally wet, slow rates of water transmission, and slow surface runoff. The Miles series has moderate infiltration and water transmission rates, and moderate surface runoff. Shrink-swell potential is low in the Miles, moderate in the Rotan, and low to moderate in the Winters series. Depth to the seasonally high water table is greater than 6 feet (Rogers and Risinger, 1979). The soils are classified as prime farmland (Connors, 1990) and are not hydric (SCS, 1987).

Drainage is southward, with runoff eventually reaching the Brazos River, 2 miles to the south. Two irrigation wells are approximately 85 feet west and 157 feet northwest of the site boundary. The nearest surface water is an intermittent stream 2,000 feet south of the site. A wetlands area, containing willows and cattails, and a permanent stock pond are approximately 1 mile south of the site. During spring and fall migration, 20 to 30 waterfowl use the pond daily; a small number of ducks uses the stock pond year-round (Beck, 1989). Small numbers of waterfowl occasionally use the field to feed (Scott, 1989).

The site was planted in wheat during field investigations; surrounding fields are cultivated for both wheat and cotton. Short grasses, giant ragweed, and tumbleweed line the edge of the field next to the road; a shelterbelt of trees located 0.5 mile to the south marks the southern field boundary.

The historic structures survey identified three properties (Gray Homestead, Blacksmith Shop, Dr. Henderson House) that are potentially eligible for the NRHP within 1.5 miles of the CGS (see Figure 3.4 of this EA). They are all located within the town of Vera. These properties are significant because they are typical architectural types that reflect the historic agricultural development of the area (Foster and Voellinger, 1991).

The Gray Homestead, located 1.2 miles northwest, is a Queen Anne style cottage that probably dates back to the late 19th century. Although the interior was modernized and then again renovated in the 1970s, this structure is one of the most intact and well detailed examples of Vera's railroad-era domestic agricultural residences and therefore is eligible based on its architectural character (Foster and Voellinger, 1991). Setting is not important to the eligibility of this site. Therefore, the eligibility of this historic structure would not be affected by potential visual impacts from a GWEN tower.

The Blacksmith Shop, located 1.2 miles northwest, is one of the oldest structures in Vera and one of the few remaining commercial structures that served the town's agriculturally based development in the early 20th century. It is a small, open-plan, gabled barn of pole and frame construction that is now mostly metal-clad. Despite the alterations, it is one of the best surviving examples of its architectural type in the project area and therefore is potentially eligible for the NRHP (Foster and Voellinger, 1991). Setting is not important to the eligibility of this site. Therefore, the eligibility of this historic structure would not be affected by potential visual impacts from a GWEN tower.

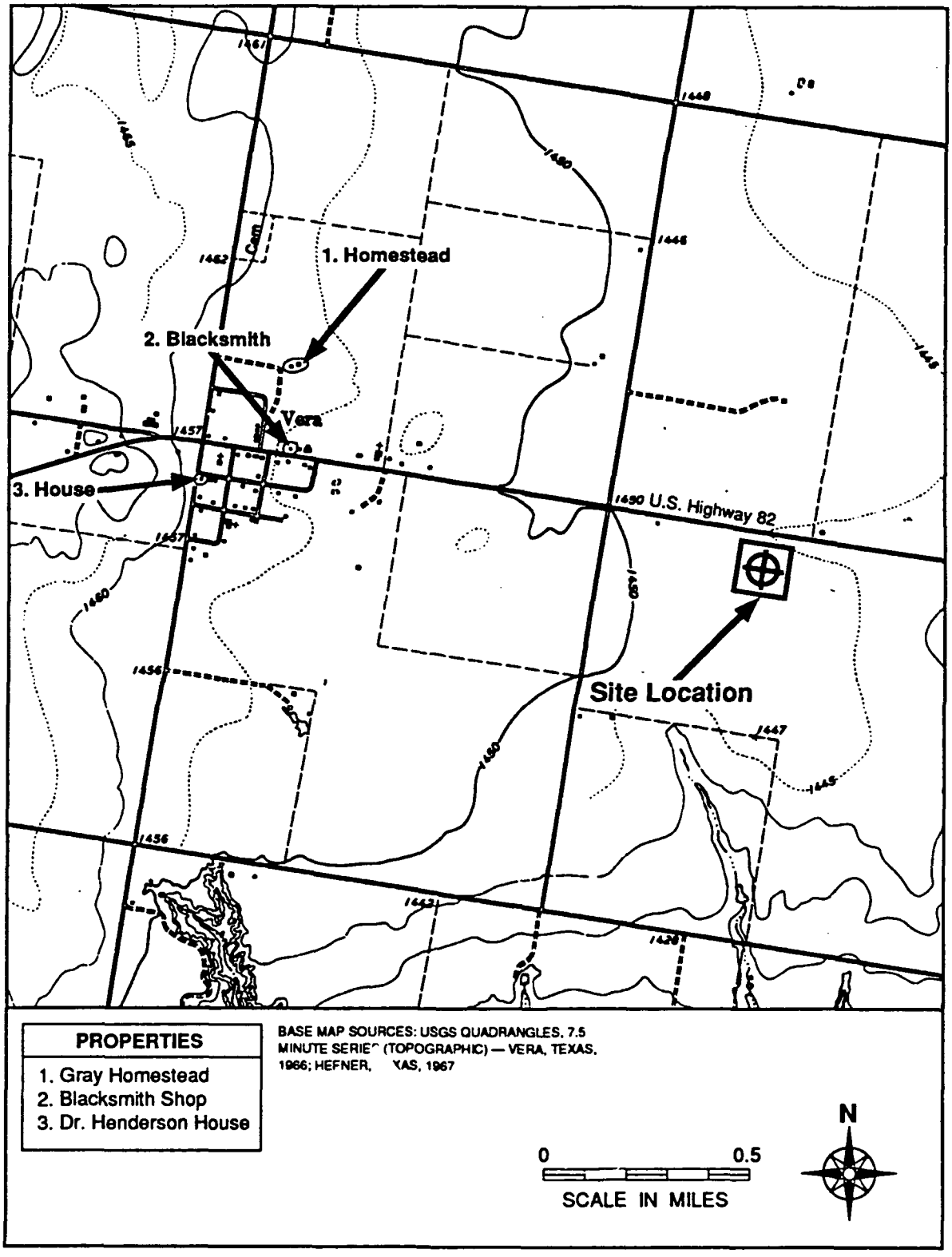


FIGURE 3.4 LOCATIONS OF PROPERTIES THAT ARE POTENTIALLY ELIGIBLE FOR LISTING ON THE NATIONAL REGISTER OF HISTORIC PLACES WITHIN 1.5 MILES OF THE SCOTT SITE (CGS-3)

The Dr. Henderson House, located 1.4 miles west, was reportedly the residence of one of Vera's early physicians and probably dates to the turn of the century. It is a hipped-roof, tee-plan Victorian-era cottage built of plank walls and weatherboard siding whose exemplary railroad-era architectural qualities make it potentially eligible for the NRHP (Foster and Voellinger, 1991). Setting is not important to the eligibility of this site. Therefore, the eligibility of this historic structure would not be affected by potential visual impacts from a GWEN tower.

The closest residential area of Vera is 1.1 miles west of the site.

3.4 Alternative 3: Smajstrla Site (CGS-5)

The Smajstrla site contains a slight depression along its eastern border and slightly higher ground along its southern border. Maximum slope is 1 percent. The soil is composed of Miles fine sandy loam soil, which is moderately susceptible to water erosion and soil blowing. It is a deep, well-drained soil with no flooding hazards. It has a moderate infiltration rate when totally wet and a moderate rate of water transmission. Acidity is neutral to moderately alkaline, with pH values ranging from 6.6 to 8.4; shrink-swell potential is low. Depth to the seasonally high water table is greater than 6 feet (Rogers and Risinger, 1979). This soil is classified as prime farmland if irrigated (Connors, 1990), and is not hydric (SCS, 1987). The site is not irrigated (Smajstrla, 1991).

Drainage is to the north, with runoff eventually reaching the Brazos River, approximately 2.25 miles to the north. The nearest surface water is an intermittent stream 1,800 feet west of the site.

The site was planted in wheat during field investigations; surrounding fields were cultivated for cotton and wheat. The site is bounded on the north and east by weedy vegetation.

The historic structures survey identified the town of Rhineland as a potential historic district on the NRHP; setting is important to its eligibility (see Figure 3.5 of this EA). Rhineland, located approximately 1.1 miles north of the CGS, was founded in 1895 by German

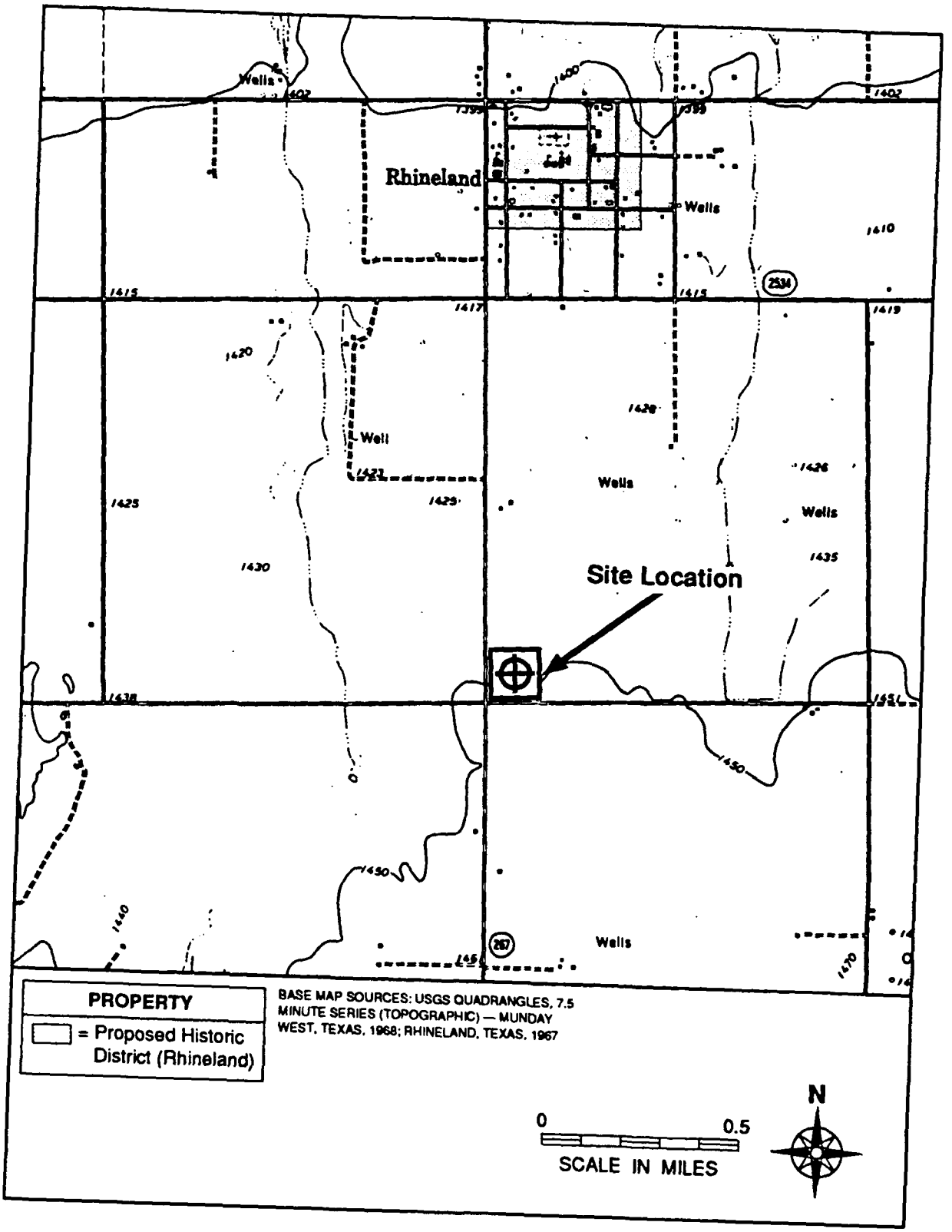


FIGURE 3.5 LOCATION OF DISTRICT THAT IS POTENTIALLY ELIGIBLE FOR LISTING ON THE NATIONAL REGISTER OF HISTORIC PLACES WITHIN 1.5 MILES OF THE SMAJSTRLA SITE (CGS-5)

Catholic immigrants. The original town plan, following the pattern of small European villages, called for a four-block church and cemetery square surrounded by a regular grid of small, narrow lots. St. Joseph's Catholic Church, a Gothic Revival style, basilica plan church built between 1928 and 1951, is today located in that square and is the focus of that historic district. The church is independently eligible for the NRHP. Designed by the local clergy and congregation in consultation with San Antonio architect, Leo Diehelman, the church is built of 80,000 locally produced handmade bricks and masonry blocks (Foster and Voellinger, 1991).

The remainder of the town, however, developed along patterns similar to other central Texas German farming villages, where families lived in town on small farmsteads and tended additional agricultural land outside the town. Houses in the community represent a variety of historic architectural types that reflects the local citizen's willingness to adopt prevailing architectural styles in lieu of more traditional Germanic house types associated with earlier central Texas Germanic communities. Such examples include the John Decker House, Mrs. Joseph Albus House, Francis Albus House, and the John Albus House, each of which is potentially eligible for the NRHP (Foster and Voellinger, 1991).

The closest residential area within Rhineland is 1.1 miles north of the site.

3.5 Alternative 4: Homer Site (CGS-6)

The Homer site is a level tract of land composed of Altus fine sandy loam and Rotan clay loam soils, which have a slight susceptibility to water erosion. The soils are deep and well-drained, with no flooding hazards. Altus fine sandy loam is characterized by moderate susceptibility to wind erosion, moderate shrink-swell potential, and acidity levels that are slightly acidic to neutral, with pH values ranging from 6.1 to 7.3. This soil has a moderate infiltration rate when totally wet and a moderate rate of water transmission. Depth to the seasonally high water table is greater than 6 feet (Rogers and Risinger, 1979). This soil is classified as prime farmland (Connors, 1990) and is not hydric (SCS, 1987).

Rotan clay loam is characterized by slight susceptibility to wind erosion, moderate shrink-swell potential, and acidity levels that are mildly to moderately alkaline, with pH values ranging from 7.4 to 8.4. This soil has a slow infiltration rate when totally wet and a slow water transmission rate. Depth to the seasonally high water table is greater than 6 feet (Rogers and Risinger, 1979). This soil is classified as prime farmland (Connors, 1990) and is not hydric (SCS, 1987).

Drainage is to the north, with runoff eventually reaching the Brazos River, approximately 2.5 miles to the north. Very shallow water stands on less than an acre of the site for a week or less each year. The soil is not hydric, there was no hydrophytic vegetation observed at the site, and the water table is greater than 6 feet, so the area does not meet federal criteria for a wetland. The nearest stream is an intermittent stream 2,200 feet west of the site, which runs for only 1 day after a rainfall (Homer, 1989).

The site and surrounding fields were planted in wheat during field investigations. The site is bordered by short grasses and tall shrubs along the eastern and northern peripheries. A shelterbelt 2,200 feet west of the site, running along the intermittent stream, consists of a variety of non-native juniper trees (Sims, 1989). A small number of ducks occasionally feeds in the field (Homer, 1989).

No properties that are potentially eligible for listing on the NRHP occur within 1.5 miles of the site (Foster and Voellinger, 1991).

The closest residential area of Rhineland is 1.8 miles north of the site.

3.6 Alternative 5: Parris Site (CGS-7)

The Parris site has a 1 percent slope and is composed of Miles fine sandy loam soil, which is moderately susceptible to water erosion and soil blowing. It is a deep, well-drained soil with no flooding hazards, has a moderate infiltration rate when totally wet, and a moderate rate of water transmission. Acidity is neutral to moderately alkaline, with pH values ranging from 6.6 to 8.4; shrink-swell potential is low. The depth to the seasonally high

water table is greater than 6 feet (Rogers and Risinger, 1979). This soil is classified as prime farmland if irrigated (Connors, 1990), and is not hydric (SCS, 1987). The site is not irrigated (Homer, 1991).

Drainage is to the southeast; a wet-weather drainage bed showing evidence of slight erosion is in the southeast corner of the site. Runoff eventually reaches the Brazos River, approximately 1.75 miles to the south. The nearest surface water is an intermittent stream 800 feet southeast of the site.

The site is in a field that was plowed but unplanted at the time of the field investigation. The field is bordered by a windrow of giant ragweed to the south that extends into a line of trees. The fields to the east and west are also cultivated. A small number of geese and sandhill cranes occasionally feeds in the field (Parris, 1989).

The historic structures survey identified one property that is potentially eligible for the NRHP within 1.5 miles of this site. The A. E. Boyd Ranch, whose main residence is located 1.0 mile northwest, is described in Section 3.2 of this EA (see Figure 3.6 of this EA) (Foster and Voellinger, 1991). Setting is important to the potential eligibility of this property.

The residential areas of Vera and Red Springs are 4.0 miles west and 4.4 miles east of the site, respectively. A large grain elevator complex, consisting of three tall grain elevators and associated buildings, is located 0.6 mile west of the CGS.

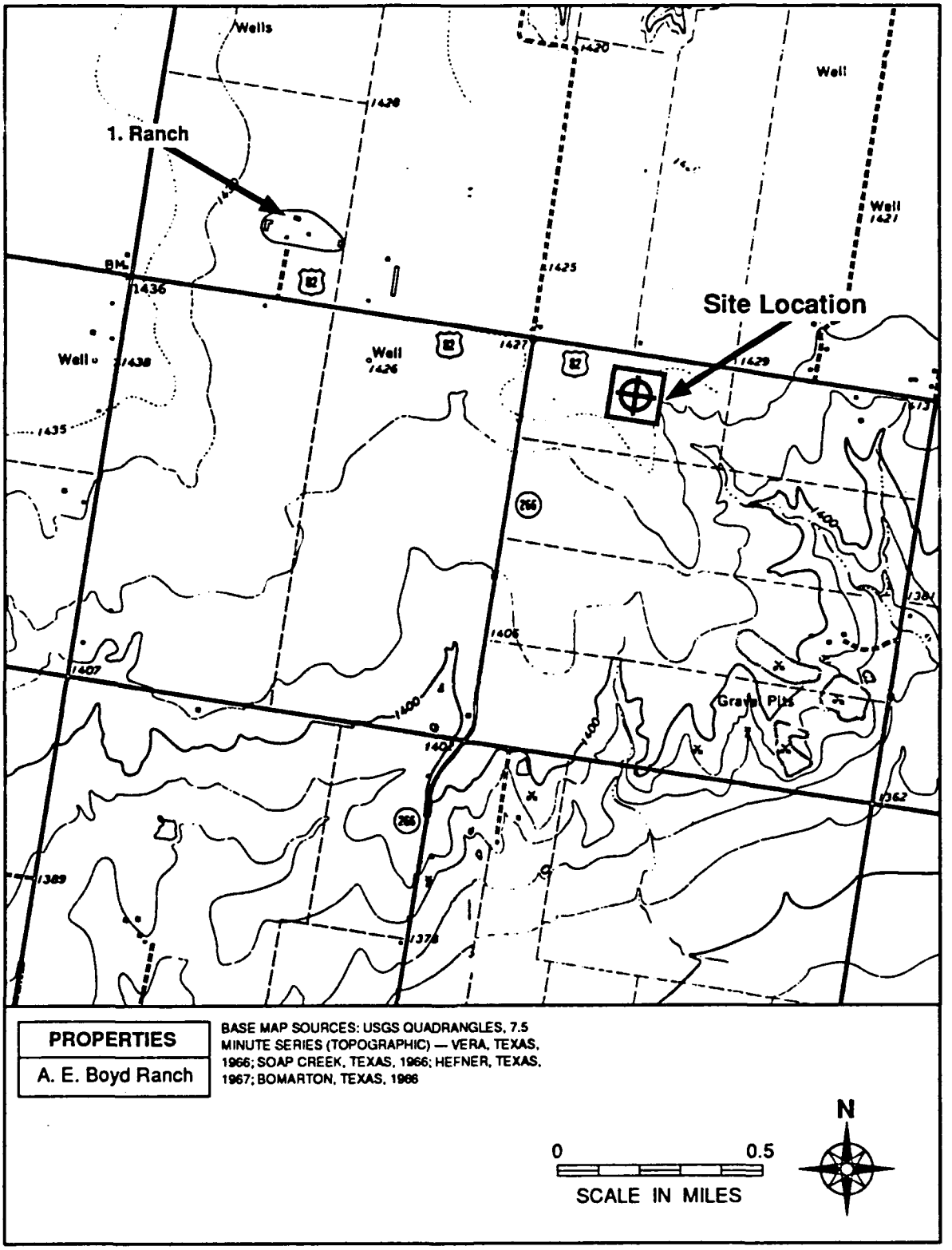


FIGURE 3.6 LOCATION OF PROPERTY THAT IS POTENTIALLY ELIGIBLE FOR LISTING ON THE NATIONAL REGISTER OF HISTORIC PLACES WITHIN 1.5 MILES OF THE PARRIS SITE (CGS-7)

4.0 ENVIRONMENTAL CONSEQUENCES OF ACTION ALTERNATIVES

This section discusses the potential impacts of the GWEN project on the environmental setting of the five CGSs in north central Texas. Several impacts that would be common to some or all of the action alternatives are discussed in Section 4.1 of this EA. Impacts that are unique to each action alternative are discussed in Sections 4.2 through 4.6 of this EA. As indicated in Sections 4.3 and 4.4 of this EA, the project would have significant visual impacts if built on the Scott site (CGS-3) or the Smajstrla site (CGS-5). There would be no significant impacts on the Walker (CGS-2), Homer (CGS-6), or Parris (CGS-7) site, as indicated in Sections 4.2, 4.5, and 4.6 of this EA.

4.1 Common Features

Presented below is information on the physical, biological, and socio-cultural impacts common to some or all of the action alternatives.

4.1.1 Physical

Impacts from **construction** activities would not be significant. Construction would require localized earth-moving, including excavation and backfilling for placement of foundations and guy-wire anchors. Less than 3,800 square feet would be covered with concrete and gravel for the tower base and the equipment area enclosures. Similar coverage would be required for on-site access roads and parking; incidental activities during construction would disturb a similar amount. In total, about 0.25 acre would be occupied by foundations and the on-site access roads. Construction of the off-site access road and installation of utility lines would have no significant impacts because the sites are on relatively level terrain and the access road would require little grading. Furthermore, the disturbed area would occur within previously graded private farmland or public highway right-of-way. The access road would cover between 576 square feet and 4,200 square feet of land, depending on the site selected.

The ground plane would be installed using machines that bury wire approximately 1 foot below the surface with minimal disturbance of the soil surface. This process would require

moving a small tractor or similar equipment over much of the 11-acre site but would not significantly disturb the existing vegetation or create a significant erosion hazard.

No significant impacts on **mineral resources** are expected (Ainsworth, 1990; McNeel, 1990). Should a gas or oil deposit be discovered at the Homer site (CGS-6) during the term of the mineral lease, access to the deposit would not necessarily be precluded because a well constructed outside the CGS could tap into resources beneath the site. However, if it is determined that the drill hole should intercept the gas- or oil-bearing horizon directly beneath the proposed tower, access to the deposit could be restricted, resulting in a minor impact. The impact would last only as long as the project and would be reversible.

Impacts on **paleontological resources** would not be significant. Although the maximum depth of excavation during construction will be about 5 feet, soil cover at three CGSs (Walker, CGS-2; Scott, CGS-3; Parris, CGS-7) is expected to be greater than 4 feet; soil cover is expected to be at least 5 feet at the other two CGSs (Smajstrla, CGS-5; Homer, CGS-6). In addition, the uppermost portion of the Seymour Formation is quite barren. Only a single specimen has been recovered from the uppermost portion of this formation, which is up to 3 feet thick. The paleontological survey found no fossils on any of the CGSs (Hook, 1990b). For these reasons, paleontological resources are not expected to be encountered at any of the sites. However, if any fossils are found during construction, work that might affect them would be suspended while a qualified paleontologist is contacted and the significance of the find is evaluated.

Erosion and increase in storm water runoff would not be significant. All sites have slopes of 2 percent or less and will not require any grading. In addition, standard measures for erosion control would be used during and after site construction, including replanting the site.

No CGS lies within a **100-year floodplain** according to the Soil Conservation Service (Jones, 1990).

A maximum of 11 acres of **prime farmland** would be removed from production for the duration of the project; however, impacts of GWEN development on agricultural land would not be significant, as discussed in Section 4.1.1.3, page 4.1-2 of the FEIS.

Impacts on **drinking water** are not expected because, as stated in Sections 3.2.4.1 and 4.2.1.1, pages 3.2-2 and 4.2-3 of the FEIS, corrosion of the ground plane is not anticipated to raise copper concentrations in any aquifer or surface water body by more than 20 micrograms per liter (µg/l). This represents 2 percent of the maximum allowable copper concentrations permitted by the State of Texas for raw water sources for potable water supply (Texas Administrative Code (TAC), Title 31, Section 290.13 and 25 TAC, Section 337.2-337.14) (Lannen, 1990; Mitchell, 1990). The Texas standard is the same as the Environmental Protection Agency (EPA) standard, which is intended to maintain the aesthetic properties that relate to public acceptance of drinking water and is not related to public health. A threshold for the effects of copper on human health has not been determined (EPA, 1985).

Potential impacts on **surface water or wetlands** that support aquatic plants and animals could occur when the site is less than 300 feet from surface water or wetlands, if the soil is acidic, or the depth to the seasonally high water table is less than 3 feet from the ground plane (4 feet from the surface), as discussed in Section 4.2.1.1, page 4.2-3 of the FEIS. Such impacts are not expected at any site because all sites are at least 430 feet from any stream or wetlands, the depth to the seasonally high water table is greater than 6 feet, and the soils are neutral to moderately alkaline, except for one of the soils on the Homer site (CGS-6), which is slightly acidic. Under these conditions, the amount of copper that might leach into surface water 430 feet from the site would be negligible.

Impacts on **air quality** would not be significant. Temporary but insignificant increases in air pollutant emissions would occur during construction, primarily from greater use of heavy machinery than would be required during normal farming operations. During operation of the BUPG at 100 percent load, total yearly emissions from the BUPG would be less than 350 pounds per pollutant, as described in Section 2.1.2 of this EA. These are well below the standards set by the State of Texas (31 TAC, Section 116.6), which require permits for facilities emitting carbon dioxide or nitrogen oxides at the rate of 250 tons per

year or 25 tons per year of any other air contaminant except carbon dioxide, water, nitrogen, methane, ethane, hydrogen, and oxygen. Hence, the project would not result in violation of National Primary and Secondary Ambient Air Quality Standards, which have been adopted by the State of Texas (31 TAC, Section 101.21).

4.1.2 Biological

Impacts on **wildlife and wildlife habitats** would not be significant. Each CGS is an agricultural field that is under cultivation or is fallow, and each is sited away from high density use areas. As discussed in Section 3.1.2 of this EA, none of the sites contains natural plant communities, is located in riparian zones, or is within 300 feet of wetlands.

Bird collisions with the tower or its guy wires may occur but are not expected to be significant. Section 4.4.1.5, beginning on page 4.4-5 of the FEIS states that the majority of bird collisions occur in adverse weather conditions when the visibility of man-made structures is obscured and birds may be forced to lower their flight level. Generally songbirds (passerines) are more likely to collide with a tower or the guy wires than are raptors or waterfowl (Avery *et al.*, 1980). Areas with high concentrations of bird flight activity, feeding and nesting habitats, raptor roosting areas, and prominent topographical features such as high ridges and waterways that could concentrate avian flight lanes were avoided. None of the CGSs is in constricted flight corridors where the potential for bird collisions would be high. The Brazos River, which is a high waterfowl use area, is between 1.5 and 2.5 miles from the CGSs. Although waterfowl occasionally forage at the candidate sites, the sites are not likely to be used by a significant number of migratory birds (Appendix C, Short, 1990, page C-6 of this EA). Most foraging occurs in grainfields closer to the river (Lewis, 1989a).

No federally listed **threatened or endangered species** would likely be affected. This determination was made after informal consultation with the USFWS in compliance with Section 7 of the Endangered Species Act of 1973 as amended (16 USC 1531, *et seq.*, at 1536). Although the SSA is located within the broadly defined migratory corridor of the federally endangered whooping crane (*Grus americana*), no adverse impacts are likely. Most whooping crane flights are east of the CGSs (Lewis, 1989a, 1989b). Whooping

crane roost sites tend to be isolated, shallow open water bodies that have a minimal amount of vegetation to block the crane's view and a depth of water no more than 30 centimeters. The whooping crane prefers roost sites 300 to 2,400 feet from man-made structures and other disturbances, depending on the type of disturbance (Armbruster, 1990). This habitat does not exist on any CGS, as no surface water of any kind occurs within 400 feet of any CGS. The USFWS concurs with this determination (Appendix C, Short, 1990, page C-6 of this EA). No whooping cranes have been sighted in the area as of July 1991 (Jobman, 1991).

No species of concern or species listed by the State of Texas as rare, threatened, or endangered would be affected. As discussed in Section 3.1.2 of this EA, the Texas kangaroo rat would not occur at any of the sites due to the presence of unlikely soil types or unlikely land use patterns (Sullivan, 1990; Wahl, 1990). No impacts to the smalleye or sharpnose shiners are expected to occur because all sites are at least 1.5 miles from the Brazos River. All CGSs are sited away from breaks country, so the palo duro mouse would not be affected. There are no plant species of concern recorded in Knox County (Sullivan, 1991).

4.1.3 Socio-Cultural

Local employment would be increased slightly, primarily through use of local subcontractors for earth-moving and possibly for some of the facility's maintenance.

Impacts on **community support systems** would not be significant because the relay node will be unmanned and will use modest amounts of power (comparable to that used by an average single-family house). Security needs will be met through agreements with local police officials to monitor the integrity of the site during routine patrols, as detailed in Section 4.6.1.1, page 4.6-1 of the FEIS.

Impacts on **land use** would not be significant. The area containing the CGSs is rural and is not zoned by Knox County (Brown, 1992). Care was taken in the site selection process to maintain setbacks from institutional uses such as schools, churches, recreational areas, and areas zoned residential. The tower would not significantly affect property values

because non-noxious, nonresidential land uses, such as the proposed relay node, have no systematic effect on housing values, as stated in Section 4.7.1.3, page 4.7-8 of the FEIS.

Construction **noise** impacts would be temporary and insignificant. Operational noise from the back-up generator would be less than 72 dBA at the site boundary. At 50 feet beyond the site boundary the noise level would drop below 65 dBA, as discussed in Section 2.1.2 of this EA. Although Knox County has no noise ordinances (Perdue, 1991), this noise level is within the standards typically set for residential and mixed residential/agricultural use (55 to 65 dBA), as stated in Section 3.5.3, page 3.5-2 of the FEIS. In addition, the BUPG would only operate at this noise level for 2 hours per week during testing and during commercial power outages.

Impacts on **public health and safety** would not be significant, as discussed in Sections 4.11 and 4.12, beginning on pages 4.11-1 and 4.12-1, respectively, of the FEIS. Shock and burn risks would be associated with the buildup of electrical charges on ungrounded metallic objects inside the inner exclusionary (8-foot) fence located approximately 20 feet from the tower base. However, a grounded person within the outer exclusionary (4-foot) fence located approximately 330 feet from the tower base who touches an ungrounded object while the tower was transmitting would experience only a mild shock, sufficient to cause the individual to break contact but not cause harm. Furthermore, because the transmission periods would total between 6 and 8 seconds per hour during normal operations, the risk of even these mild shocks would be insignificant. Only a determined effort to enter the inner exclusionary zones, within the 8-foot fence, would put a person at increased risk of higher shock and a higher specific absorption rate, dependent on the period of prolonged grasping contact with an ungrounded metallic object. Fire hazards at the relay node facility would be low, as discussed in Section 4.12.1.1, page 4.12-1 of the FEIS. Radio-frequency emissions would not cause adverse health effects, as discussed in Section 4.4.1.6, pages 4.4-6 and 4.4-7 of the FEIS. Subsequent to the publication of the FEIS, further study confirmed the conclusion of the FEIS that there is no evidence of adverse effects of GWEN radio-frequency emissions on public health (NRC, 1992).

The relay node would operate in the LF band and therefore would not interfere with pacemakers, emergency communications, commercial and amateur radios, televisions, or garage door openers, as noted in Section 2.1.1.1, page 2-3 of the FEIS.

Impacts on **archaeological resources** would not be significant. The on-site archaeological survey revealed no cultural remains at any of the sites (Voellinger, 1990). The Texas SHPO concurs that the proposed project will not affect any archaeological resources listed or eligible for listing on the NRHP (Appendix C, Bruseth, 1990, page C-8 of this EA). Although the archaeological surveys for the Walker, Scott, and Parris sites (CGSs -2, -3, and -7) were conducted prior to relocation, additional work was not undertaken because of the low archaeological site potential in the project area (Appendix C, Bruseth, 1990, page C-7 of this EA). However, if any archaeological resources are found during construction, work that would affect them would be suspended while the Texas SHPO is notified in accordance with the provisions of 16 USC 470, *et seq.*, at 470f.

Impacts on **historic properties** would not be significant at any of the sites. Five historic sites, with a total of 29 structures, and the Rhineland Historic District, comprised of 11 structures, all determined to be eligible for listing in the NRHP, occur within 1.5 miles of CGSs -2, -3, -5, and -7. No eligible properties occur within 1.5 miles of CGS-6. The Texas SHPO has determined that there would be no effect to historic properties listed or eligible for listing on the NRHP at CGSs -2, -3, and -7, and no adverse effect to the Rhineland Historic District near CGS-5 (Appendix C, Graves 1991, page C-17 of this EA).

Significant impacts on **Native American traditional, religious or sacred sites** are not anticipated. Based on BIA and SHPO recommendations (Bruseth, 1989; Oheltoint, 1989; Sutherland, 1992) and on the archaeological survey (Foster and Voellinger, 1991; Voellinger, 1990), six Native American tribal organizations were contacted: the Kickapoo Traditional Tribe of Texas, the Alabama-Coushatta Tribal Office, the Apache Tribal Office, the Comanche Tribal Office, the Kiowa Tribal Office, and the Wichita Tribe. These groups were contacted by letter and again by telephone, the GWEN project was explained, and information was requested on the presence and location of any known traditional, religious, or sacred sites that could be affected by construction of the tower. Representatives of the Alabama-Coushatta Tribal Office, the Apache Tribal Office, and the

Kickapoo Traditional Council indicated no concerns (Batisse, 1991; Pewenoskit, 1991; Appendix C, Sailors, 1989, page C-18 of this EA). No other responses have been received.

Visual impacts associated with a GWEN tower are discussed in Sections 3.8 and 4.8, beginning on pages 3.8-1 and 4.8-1, respectively, of the FEIS. The significance of a visual impact would depend on the visual dominance of the GWEN facility and the sensitivity of the affected views. Visual dominance is the degree to which a GWEN facility would compete with other features of the existing landscape for the attention of the viewer. Section 3.8.4, beginning on page 3.8-3 of the FEIS defines four levels of dominance, called Visual Modification Classes (VMC):

- VMC 1, not noticeable: the tower would be overlooked by all but the most interested viewers

- VMC 2, noticeable, visually subordinate: the tower would be *noticeable* to most viewers without being pointed out but would not compete with other features for their attention

- VMC 3, distracting, visually codominant: the tower would compete with other features in the landscape for the viewer's attention

- VMC 4, visually dominant, demands attention: the tower would be the focus of attention and tend to dominate the view.

Visual sensitivity is a measure of the public's reaction to a proposed change of the affected view and is a function of the viewer's activity, awareness, goals, and values. Consequently, the more sensitive the view, the stronger will be the public reaction to any alteration of it. Areas defined in the FEIS as having high visual sensitivity include national and state parks; designated scenic routes; designated national, state, or local historic sites where setting is important to their historic significance; and travel routes providing primary access to these sites. Examples of areas having medium visual sensitivity would be locally popular, but undesignated, beaches or public use areas and the travel routes that

provide primary access to them. Travel routes that pass near or provide access to high sensitivity views, such as historic properties but, primarily serve other destinations are also considered medium sensitivity. Travel routes are considered sensitive on segments within 0.5 mile of the property and 1.5 miles of the tower, based on FEIS criteria and review by visual analysis specialists (Duffey, 1991). Low visual sensitivity includes those views from sites, areas, travel routes, and sections of travel routes not identified as medium and high in sensitivity.

Significant visual impacts would occur if the relay node facility were to dominate or codominate (VMC 4 or 3) a high-sensitivity view or dominate (VMC 4) a medium-sensitivity view. If the relay node facility cannot be seen from medium-to-high sensitivity routes or areas, then visual impacts are not considered significant. Distance is the primary factor in determining visual dominance and therefore visual impacts. At distances greater than 3 miles, a GWEN tower would not be visible to the unaided eye. At 1.5 to 3 miles, the tower would be visually subordinate if noticeable (VMC 2) but more usually would not be noticed (VMC 1) because of its grey color and lack of mass. If a viewer at this distance actively sought the tower, it would appear as a thin vertical line on the horizon. Within 1.5 miles, the tower becomes a more important component of the view. In addition, other aspects of the tower's setting, such as focal point sensitivity, skyline complexity, competing feature interest, and topographic and vegetative screening, become important considerations in determining the level of visual impact.

USGS topographic maps and a windshield survey were used to determine whether high or medium sensitivity views were within 1.5 miles of the CGSs. The visual impacts associated with each site are discussed in Sections 4.2 to 4.6 of this EA.

4.2 Alternative 1: Walker Site (CGS-2)

No significant impacts are expected.

Impacts on **wildlife and wildlife habitats** would not be significant because the small wooded area near the site is not considered critical wildlife habitat. The site is surrounded by fields, and deer could not use it as a travel corridor or escape route (Cloud, 1989b; Sims, 1989).

Impacts on **historic properties** would not be significant. The A. E. Boyd Ranch, whose main residence is located 1.3 miles northwest of the CGS, is eligible for the NRHP (Appendix C, Steely, 1991, pages C-11 to C-14 of this EA), and setting is important to its eligibility (Foster and Voellinger, 1991). The main residence and barn comprise the historic core of the ranch, and primary consideration was given to views from those structures. Although the topography between the CGS and the ranch property is very level, a large grain elevator complex intervenes between the CGS and the ranch. The grain elevator complex, along with trees scattered throughout the ranch, would completely block views of the tower. Therefore, the tower would not be visible and would not create a significant impact.

Visual impacts on travel routes passing near the ranch would not be significant. The segment of U.S. Highway 82 that passes within 0.5 mile of the A. E. Boyd Ranch is considered medium visual sensitivity because it passes near a high sensitivity view while primarily serving other destinations. To travelers approaching the ranch from the west on that segment of the highway, the ranch and the proposed tower would appear in the same 130° field of view, as defined in Section 4.8.4, page 4.8-22 of the FEIS, until the viewer passes the ranch. At its closest point, the tower would be 1.2 miles away. Although the tower would have focal point sensitivity due to its proximity to the highway, the grain elevator complex located north of the highway would provide competing feature interest and, along with scattered trees on both sides of the highway, would create moderate skyline complexity. The ranch would also provide competing feature interest. Therefore, the tower would be codominant (VMC 3) with the grain elevator complex, trees, and ranch complex and would not create a significant visual impact. In approaches from the east, the tower would be behind the viewer and therefore would not be visible.

There are no other high or medium sensitivity views within 1.5 miles of the CGS.

4.3 Alternative 2: Scott Site (CGS-3)

Significant impacts are expected.

Visual impacts on the town of Vera, 1.1 miles west, would be significant. Vera is a residential area, and views from the town are considered high sensitivity, following the guidelines in Section 3.8.4, page 3.8-5 of the FEIS. Views toward the east from the east side of town are essentially of flat, agricultural fields. The skyline complexity is generally low, although intervening farmsteads and their associated windbreaks provide some vertical elements. There is no competing feature interest, and the tower would have varying levels of focal point sensitivity, depending on how far south the viewer is from U.S. Highway 82. Given these general conditions, the tower would be visually codominant (VMC 3) when viewed from the town of Vera, causing a significant impact.

Impacts on **wildlife and wildlife habitats** would not be significant. The stock pond *and surrounding wetlands area* 1 mile south of the site are not considered part of a critical local flyway (Cloud, 1989b; Sims, 1989). Few waterfowl use the Scott site for feeding (Scott, 1989).

Impacts on **historic properties** would not be significant. Three properties (Gray Homestead, Blacksmith Shop, Dr. Henderson House) located within the town of Vera are eligible for the NRHP (Appendix C, Steely, 1991, pages C-11 to C-14 of this EA). These properties are significant for their architectural merits (Foster and Voellinger, 1991). Eligibility of these historic properties would not be affected by impacts from a GWEN tower (Appendix C, Graves, 1991, page C-17 of this EA).

4.4 Alternative 3: Smajstrla Site (CGS-5)

Significant impacts are expected.

Visual impacts on the town of Rhineland would be significant. Rhineland is a residential area, and therefore any views from it are considered to have high sensitivity following the

guidelines in Section 3.8.4, page 3.8-5 of the FEIS. The tower would be most visible to residences in the southern portion of the town because other elements in views from further north in Rhineland, particularly other buildings in the town itself, would provide greater degrees of skyline complexity, screening, and competing feature interest and thus make the tower less visible. The tower would be about 1.0 to 1.1 miles from each of the southernmost residences along each of the north-south streets in Rhineland. The area between the residences and the tower contains flat agricultural fields that provide no topographic or vegetative screening to the tower. Skyline complexity is low as seen from any of those residences. A farmstead located 0.4 mile north of the CGS would screen approximately the lower 20 percent of the tower, particularly from those views from the westernmost residence, but other screening features are absent. From views in the western parts of town, U.S. Highway 267, leading south from Rhineland, creates focal point sensitivity. The tower would be distracting (VMC 3) to residences in the southern part of town, creating a significant visual impact.

Impacts on **historic properties** would not be significant. The Rhineland Historic District, located 1.2 miles north of the CGS, is eligible for the NRHP (Appendix C, Steely, 1991, pages C-11 to C-16 of this EA), and setting is important to its eligibility (Foster and Voellinger, 1991). In the northern portions of the district, views of the tower would be blocked by other structures and vegetation further south within the town. From the southern portion of the district, the tower would be visible across flat agricultural fields. However, other structures farther south of the district's boundary in the town provide substantial vertical variation, creating a moderate to high complexity skyline in conjunction with associated vegetation. In addition, most of those structures have large TV antennas that are similar in appearance to the GWEN tower at distances of greater than 1 mile. The four north-south roads within the town provide some focal point sensitivity, depending upon the exact orientation of the observer. The lower 20 percent of the tower would be blocked by a small rise in the landscape that occurs in the southern part of Rhineland. Vegetative screening, provided mostly by trees associated with other structures in town, varies from almost none to complete. Therefore, the tower would at most be noticeable but visually subordinate (VMC 2) to other features in the view, especially other structures south of the district, and would not adversely affect the Rhineland Historic District (Appendix C, Graves, 1991, page C-17 of this EA).

Visual impacts on travel routes to the proposed Rhineland Historic District would not be significant. Segments of State Highway 267 and County Road 2534 that come within 0.5 mile of the district would be considered medium visual sensitivity because they pass near a high sensitivity view while primarily serving other destinations. The 0.5-mile segment of State Highway 267 that is north of the proposed district is outside the 1.5-mile radius around the CGS. This distance and the structures that line the east side of the highway in Rhineland would make the tower not noticeable (VMC 1) as the viewer travels south toward the town. To travelers approaching the town from the south, the tower would be behind them and therefore would not be visible.

To travelers on County Road 2534 approaching Rhineland from the east, the tower would be 1.1 miles southeast of the road when it passes out of their 130° field of view. The views toward the tower are of flat, agricultural fields with occasional farmsteads and their associated windbreaks, therefore skyline complexity is low. However, the road tends to focus views westward toward its intersection with State Highway 267. Rhineland, north of County Road 2534, provides competing feature interest and would receive more attention due to the presence of St. Joseph's Catholic Church, located in the center of the proposed historic district. Therefore the tower, lacking focal point sensitivity, would be noticeable but visually subordinate (VMC 2) to the church and other town features and would not create a significant visual impact.

To travelers on County Road 2534 approaching Rhineland from the west, the tower would be 1.1 miles south of the road when it passes out of the 130° field of view. The views toward the tower are of flat, agricultural fields with occasional farmsteads and their associated windbreaks, so skyline complexity is low. However, the road tends to focus views eastward, toward its intersection with State Highway 267. Rhineland, north of County Road 2534, provides competing feature interest and would receive more attention due to the presence of St. Joseph's Catholic Church, located in the center of the proposed historic district. Therefore the tower, lacking focal point sensitivity, would be noticeable but visually subordinate (VMC 2) to the church and other town features and would not create a significant visual impact.

There are no other high or medium sensitivity views within 1.5 miles of the CGS.

4.5 Alternative 4: Homer Site (CGS-6)

No significant impacts are expected.

Impacts on **historic properties** would not be significant because there are no properties listed, eligible, or potentially eligible for the NRHP within 1.5 miles of the site (Foster and Voellinger, 1991).

Visual impacts would not be significant because there are no high or medium sensitivity views within 1.5 miles of the site.

4.6 Alternative 5: Parris Site (CGS-7)

No significant impacts are expected.

Impacts on **historic properties** would not be significant. The A. E. Boyd Ranch, located 1.0 mile northwest of the CGS, is eligible for the NRHP (Appendix C, Steely, 1991, page C-11 to C-14 of this EA); setting is important to its eligibility (Foster and Voellinger, 1991). The main residence and barn comprise the historic core of the ranch, and primary consideration was given to views from these structures. Although the topography between the CGS and the ranch property is very level, a large grain elevator complex intervenes between the CGS and the ranch. The grain elevator complex, along with trees scattered throughout the ranch, would completely block views of the tower. Therefore, the tower would not be visible and would not affect the A. E. Boyd Ranch (Appendix C, Graves, 1991, page C-17 of this EA).

Visual impacts on travel routes passing near the ranch would not be significant. The segment of U.S. Highway 82 that passes within 0.5 mile of the A. E. Boyd Ranch is considered medium visual sensitivity because it passes near a high sensitivity view while

primarily serving other destinations. To travelers approaching the ranch from the west on that segment of the highway, the ranch and the proposed tower would appear in the same 130° field of view, as defined in Section 4.8.4, page 4.8-22 of the FEIS, until the viewer passes the ranch. At its closest point, the tower would be 0.9 mile away. Although the tower would have focal point sensitivity due to its proximity to the highway, the grain elevator complex located north of the highway would provide competing feature interest and, along with scattered trees on both sides of the highway, would create moderate skyline complexity. The ranch would also provide competing feature interest. Therefore, the tower would be codominant (VMC 3) with the grain elevator complex, trees, and the ranch complex, and would not create a significant visual impact. In approaches from the east, the tower would be behind the viewer and therefore would not be visible.

There are no other high or medium sensitivity views within 1.5 miles of the CGS.

4.7 No Action Alternative

No environmental impact would result from adoption of the no action alternative.

5.0 REFERENCES

Ainsworth, B., 1990. Personal communication from B. Ainsworth, Deputy Clerk for Knox County, Texas, to J. Nishida, SRI International, April 10, 1990.

Armbruster, M. J., 1990. *Characterization of Habitat Used By Whooping Cranes During Migration.* Department of the Interior, USFWS Biological Report 90(4).

Avery, M., P. F. Springer, and N. S. Dailey, 1980. *Avian Mortality at Man-made Structures: An Annotated Bibliography.* U.S. Fish and Wildlife Service.

Batisse, F., 1991. Personal communication from F. Batisse, Chairperson, Alabama-Coushatta Tribal Office, Livingston, Texas, to H. Mendel, SRI International, February 13, 1991.

Bayer, C., 1990. Personal communication from C. Bayer, Water Quality Standards Coordinator, Texas Water Commission, to J. Nishida, SRI International, May 16, 1990.

Beck, C., 1989. Personal communication from C. Beck, Landowner, PCGS-1, Vera, Texas, to J. Nishida, SRI International, October 24, 1989.

BLS, 1988. U.S. Department of Commerce, Bureau of Labor Statistics.

Brown, S., 1992. Personal communication from S. Brown, Knox County Appraisal District, to L. Forbush, SRI International, December 9, 1992.

Bruseth, J., 1989. Personal communication from J. Bruseth, Deputy State Historic Preservation Officer, Texas Historical Commission, to J. Nishida, SRI International, November 2, 1989.

Butts, L., 1990. Personal communication from L. Butts, Environmental Quality Specialist, Quality Assurance Division, Texas Air Control Board, to J. Nishida, SRI International, April 6, 1990.

Cloud, T., 1989a. Personal communication from T. Cloud, Sr. Biologist, Ecological Services, USFWS, to J. Nishida, SRI International, October 17, 1989.

Cloud, T., 1989b. Personal communication from T. Cloud, Sr. Biologist, Ecological Services, USFWS, to J. Nishida, SRI International, October 25, 1989.

Cloud, T., 1990. Personal communication from T. Cloud, Sr. Biologist, Ecological Services, USFWS, to J. Nishida, SRI International, April 16, 1990.

Connors, G., 1989. Personal communication from G. Connors, District Conservationist, Soil Conservation Service, to J. Nishida, SRI International, October 19, 1989.

Connors, G., 1990. Personal communication from G. Connors, District Conservationist, Soil Conservation Service, to J. Nishida, SRI International, May 2, 1990.

Davenport, J., 1990. Personal Communication from J. Davenport, Head of Water Quality Standards Unit, Texas Water Commission, to J. Nishida, SRI International, April 20, 1990.

Duffey, M., 1991. Personal communication from M. Duffey, Visual Resources Specialist, Environmental Science Associates, to A. McGee, SRI International, June 10, 1991.

EPA, 1985. *Ambient Water Quality Criteria for Copper.* Standards, Criteria and Standards Division, Office of Water Regulations, Washington, D. C.

FICWD, 1989. *Federal Manual for Identifying and Delineating Jurisdictional Wetlands.* U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and the USDA Soil Conservation Service, Washington, D.C., Cooperative Technical Publication.

Fitzgerald, L., 1989. Personal communication from L. Fitzgerald, Executive Vice President, Munday Chamber of Commerce, to J. Nishida, SRI International, October 19, 1989.

Foster, E., and M. Voellinger, 1991. *An Inventory and Assessment of Historic Architectural Resources Within the Vera Project Area, Knox and Baylor Counties, Texas.* Espey, Huston, and Associates, Austin, Texas, Document No. 900703, June 1991.

Garner, E., 1989. Personal communication from E. Garner, Public Affairs Geologist, Bureau of Economic Geology, University of Texas at Austin, to J. Nishida, SRI International, October 25, 1989.

Garrison, G., A. Bjugstad, D. Duncan, M. Lewis, and D. Smith, 1977. *Vegetation and Environmental Features of Forest and Range Ecosystems, Agricultural Handbook No. 475.* Forest Service, U.S. Department of Agriculture, U.S. Government Printing Office, Washington, D.C.

Harden, R. W., and Associates, 1978. *The Seymour Aquifer, Ground-Water Quality and Availability in Haskell and Knox Counties, Texas, Volume I, Report 226.* Prepared for Texas Department of Water Resources.

Homer, P., 1989. Personal communication from P. Homer, Landowner, CGS-6, to J. Nishida, SRI International, October 23, 1989.

Homer, W., 1991. Personal communication from W. Homer, Landowner, CGS-6, to H. Mendel, SRI International, July 23, 1991.

Hook, Robert W., 1990a. *Assessment of Potential Paleontologic Resources Related to the Construction of the U.S. Air Force Ground-Wave Emergency Network Relay Node, Knox County, North-Central Texas (SRI Project No. SID-8262). Phase 1: Literature Review and Record Search.* March 1990.

Hook, Robert W., 1990b. *Assessment of Potential Paleontologic Resources Related to the Construction of the U.S. Air Force Ground-Wave Emergency Network Relay Node, Knox County, North-Central Texas (SRI Project No. SID-8262). Phase 2: Water Well Inventory and Field Reconnaissance.* April 1990.

Howard, K. A., *et al.*, 1978. *Preliminary Map of Young Faults in the United States as a Guide to Possible Fault Activity.* U.S. Geological Survey Map MF-916.

Jobman, W., 1991. Personal communication from W. Jobman, USFWS, Grand Island, Nebraska, to D. Rutledge, SRI International, July 30, 1991.

Jones, C., 1990. Personal communication from C. Jones, Soil Conservation Service, to J. Nishida, SRI International, May 7, 1990.

Kinney, D. M., 1966. *"Geology," National Atlas of the United States.* U.S. Geological Survey.

Lannen, M., 1990. Personal communication from M. Lannen, Environmental Quality Specialist, Texas Department of Health, to J. Nishida, SRI International, May 15, 1990.

Lewis, J., 1989a. Personal communication from J. Lewis, Whooping Crane Coordinator, USFWS, Albuquerque, New Mexico, to J. Nishida, SRI International, October 13, 1989.

Lewis, J., 1989b. Personal communication from J. Lewis, Whooping Crane Coordinator, USFWS, Albuquerque, New Mexico, to J. Nishida, SRI International, October 21, 1989.

Lewis, J., 1989c. Base map provided by J. Lewis, Whooping Crane Coordinator, USFWS, Albuquerque, New Mexico, to J. Nishida, SRI International, October 21, 1989.

Manitakos, J., Jr., 1989. Personal communication from J. Manitakos, Jr., Geologist, SRI International, to F. Dutcher, Program Manager, Contel Federal Systems, Inc., May 10, 1989.

McNeel, F., 1990. Personal communication from F. McNeel, District Director, Oil and Gas Division, Railroad Commission of Texas, Wichita Falls, Texas, to J. Nishida, SRI International, April 10, 1990.

Mitchell, L., 1990. Personal communication from L. Mitchell, Sanitarian, Texas Department of Health, to J. Nishida, SRI International, May 7, 1990.

Nishida, J., 1989. Summary of field investigation conducted in October 1989 by J. Nishida, SRI International, November 1989.

NPDC, 1989. *Population, Housing, Income and Wealth — 1989 Update.* National Planning Data Corporation.

NRC, 1992. *An Assessment of the Possible Health Effects of the Ground Wave Emergency Network.* National Research Council, National Academy Press, Washington, D.C.

Oheltoint, F., 1989. Personal communication from F. Oheltoint, Tribal Government Services Specialist, Bureau of Indian Affairs, to J. Nishida, SRI International, November 1, 1989.

Parris, W., 1989. Personal communication from W. Parris, Landowner, CGS-7, to J. Nishida, SRI International, October 24, 1989.

Perdue, D., 1991. Personal communication from Judge D. Perdue, Knox County Courthouse, Benjamin, Texas to H. Mendel, SRI International, February 13, 1991.

Pewenoskit, A., 1991. Personal communication from A. Pewenoskit, Chairman, Apache Tribal Office, Anadarko, Oklahoma to H. Mendel, SRI International, February 14, 1991.

PIEMS, 1989a. *Heydrick's Map 3, Southwest Baylor County, Texas.* Petroleum Information Energy Map Services, San Antonio, Texas.

PIEMS, 1989b. *Heydrick's Map 4, Southeast Knox County, Texas.* Petroleum Information Energy Map Services, San Antonio, Texas.

Ransom, J. E., 1981. *Complete Field Guide to North American Wildlife, Western Edition.* Harper and Row, New York, New York.

Reagor, B. G., *et al.*, 1988. *Seismicity Map of the State of Texas.* USGS Map MF-2034.

Rogers, C., G. Passmore, and W. Risinger, 1976. *Soil Survey of Baylor County, Texas.* U.S. Department of Agriculture, Soil Conservation Service, in cooperation with Texas Agricultural Experiment Station.

Rogers, C., and W. Risinger, 1979. *Soil Survey of Knox County, Texas.* U.S. Department of Agriculture, Soil Conservation Service, in cooperation with Texas Agricultural Experiment Station.

Scott, G., 1989. Personal communication from G. Scott, Landowner, CGS-3, to J. Nishida, SRI International, October 24, 1989.

Scott, J., 1991. Personal communication from J. Scott, Landowner, CGS-3, to H. Mendel, SRI International, July 23, 1991.

SCS, 1981. *Prime and Additional Potential Prime Farmland Map of Texas.* U.S. Department of Agriculture, Soil Conservation Service, Temple, Texas.

SCS, 1987. *Hydric Soils of the United States, Second Edition.* Soil Conservation Service, U.S. Department of Agriculture, in cooperation with the National Technical Committee for Hydric Soils, December 1987.

Sims, R., 1989. Personal communication from R. Sims, Wildlife Technician, Local Field Office, Wildlife Division, Texas Parks and Wildlife Department, to J. Nishida, SRI International, October 24, 1989.

Smajstrla, A., 1991. Personal communication from A. Smajstrla, Landowner, CGS-5, to H. Mendel, SRI International, July 23, 1991.

Stover, C. W., 1986. *Seismicity Map of the Conterminous United States and Adjacent Areas, 1975-1984.* U.S. Geological Survey Map GP-984.

Sullivan, D., 1989a. Personal communication from D. Sullivan, Data Manager, Texas Natural Heritage Program, Resource Protection Division, Texas Parks and Wildlife Department, to J. Nishida, SRI International, October 17, 1989.

Sullivan, D., 1989b. Personal communication from D. Sullivan, Data Manager, Texas Natural Heritage Program, Resource Protection Division, Texas Parks and Wildlife Department, to J. Nishida, SRI International, October 18, 1989.

Sullivan, D., 1990. Personal communication from D. Sullivan, Data Manager, Texas Natural Heritage Program, Resource Protection Division, Texas Parks and Wildlife Department, to J. Nishida, SRI International, April 16, 1990.

Sullivan, D., 1991. Personal communication from D. Sullivan, Data Manager, Texas Natural Heritage Program, Resource Protection Division, Texas Parks and Wildlife Department, to D. Rutledge, SRI International, February 15, 1991.

Sutherland, D., 1992. Personal communication from D. Sutherland, Archaeologist, BIA Headquarters, Washington, D.C., to L. Forbush, SRI International, August 14, 1992.

TDHPT, 1988. *General Highway Map for Knox County, Texas.* Texas Department of Highways and Public Transportation in cooperation with the U.S. Department of Transportation, Austin, Texas.

USGS, 1966a. *7.5' Series. Bomarton Quadrangle, Texas.* U.S. Geological Survey.

USGS, 1966b. *7.5' Series. Gilliland Quadrangle, Texas.* U.S. Geological Survey.

USGS, 1966c. *7.5' Series. Soap Creek Quadrangle, Texas.* U.S. Geological Survey.

USGS, 1966d. *7.5' Series. Vera Quadrangle, Texas.* U.S. Geological Survey.

USGS, 1967a. *7.5' Series. Hefner Quadrangle, Texas.* U.S. Geological Survey.

USGS, 1967b. *7.5' Series. Rhineland Quadrangle, Texas.* U.S. Geological Survey.

USGS, 1968a. *7.5' Series. Munday East Quadrangle, Texas.* U.S. Geological Survey.

USGS, 1968b. *7.5' Series. Munday West Quadrangle, Texas.* U.S. Geological Survey.

USGS, 1975. *1:250,000 Scale Topographic Map, Wichita Falls, Texas and Oklahoma Quadrangles.* U.S. Geological Survey.

USGS, 1981. *7.5' Series. Antelope Creek NW Quadrangle, Texas.* U.S. Geological Survey.

Voellinger, M., 1990. *A Cultural Resources Survey of Five Eleven-Acre Tracts for the U.S. Air Force Ground Wave Emergency Network System, Vera Site, Knox and Baylor Counties, Texas.* Espey, Huston, and Associates, Inc., Document No. 900267.

Wahl, R., 1989. Personal communication from R. Wahl, Zoologist, Texas Natural Heritage Program, Resource Protection Division, Texas Parks and Wildlife Department, to J. Nishida, SRI International, October 31, 1989.

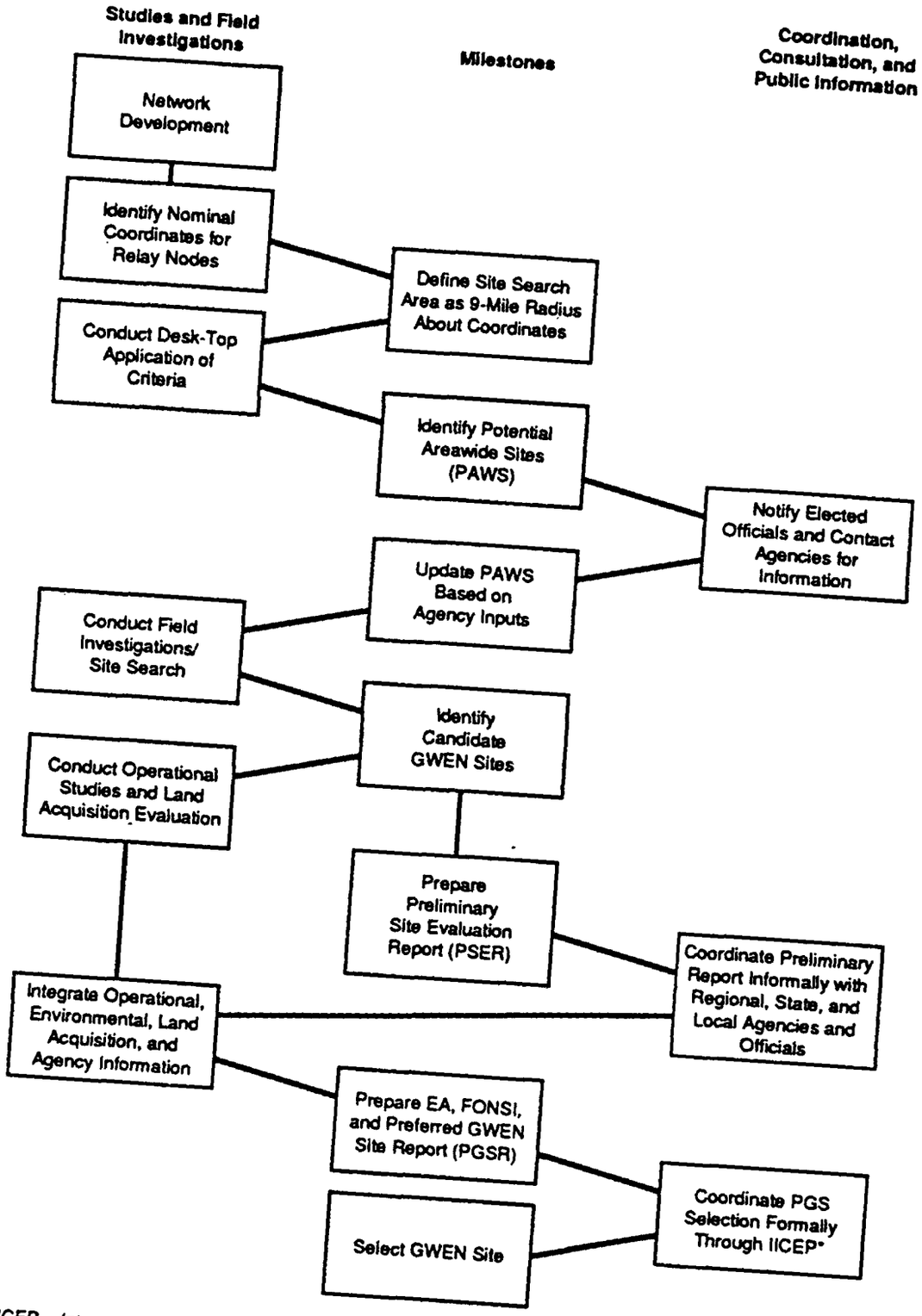
Wahl, R., 1990. Personal communication from R. Wahl, Zoologist, Texas Natural Heritage Program, Resource Protection Division, Texas Parks and Wildlife Department, to J. Nishida, SRI International, April 11, 1990.

APPENDIX A

SITE SELECTION PROCESS

SITE SELECTION PROCESS

Figure A.1 of this EA shows the sequence of events during the selection of individual GWEN sites. Figure A.2 of this EA describes the screening process used during the field investigation to choose the candidate GWEN sites (CGSs). The environmental siting criteria applied in the site selection process are defined in Tables 5-1 and 5-2, pages 5-7 through 5-14 of the FEIS.



*IICEP = Interagency/Intergovernmental Coordination for Environmental Planning.

FIGURE A.1 GROUND WAVE EMERGENCY NETWORK SITE SELECTION PROCESS

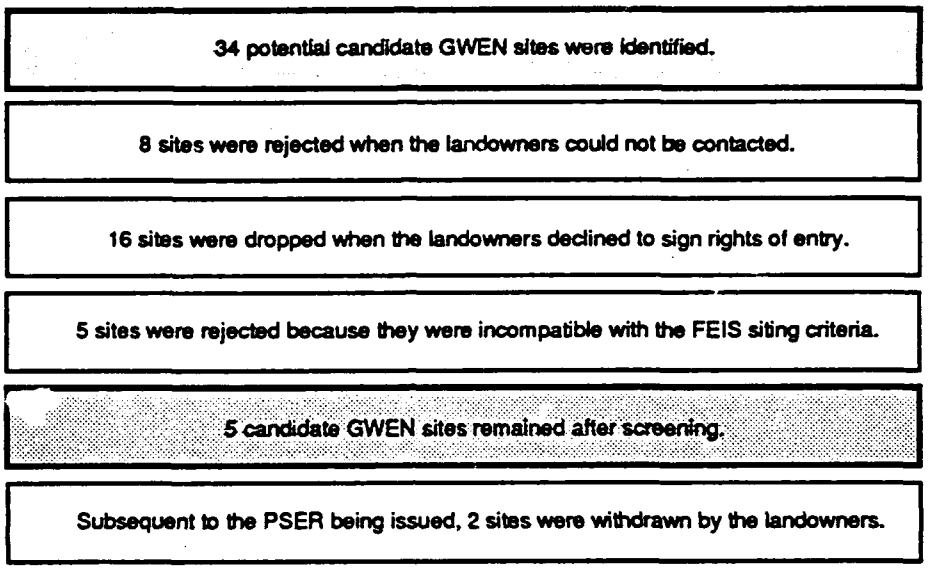


FIGURE A.2 RESULTS OF USING FEIS SITING CRITERIA TO SCREEN POTENTIAL CANDIDATE GWEN SITES IN THE NORTH CENTRAL TEXAS SITE SEARCH AREA.

APPENDIX B

TOPOGRAPHIC SETTINGS OF CANDIDATE GWEN SITES

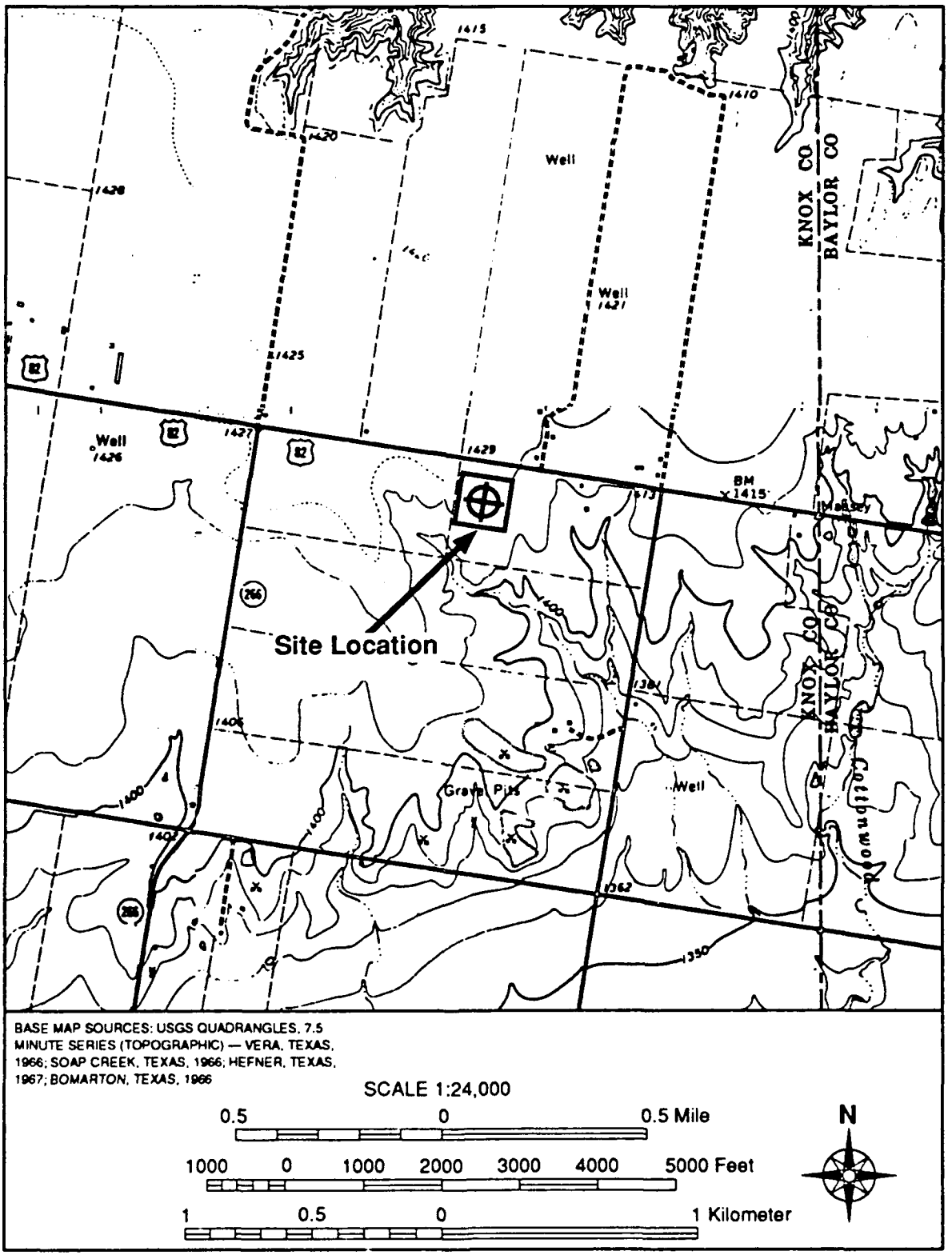


FIGURE B.1 TOPOGRAPHIC SETTING OF THE WALKER SITE (CGS-2)

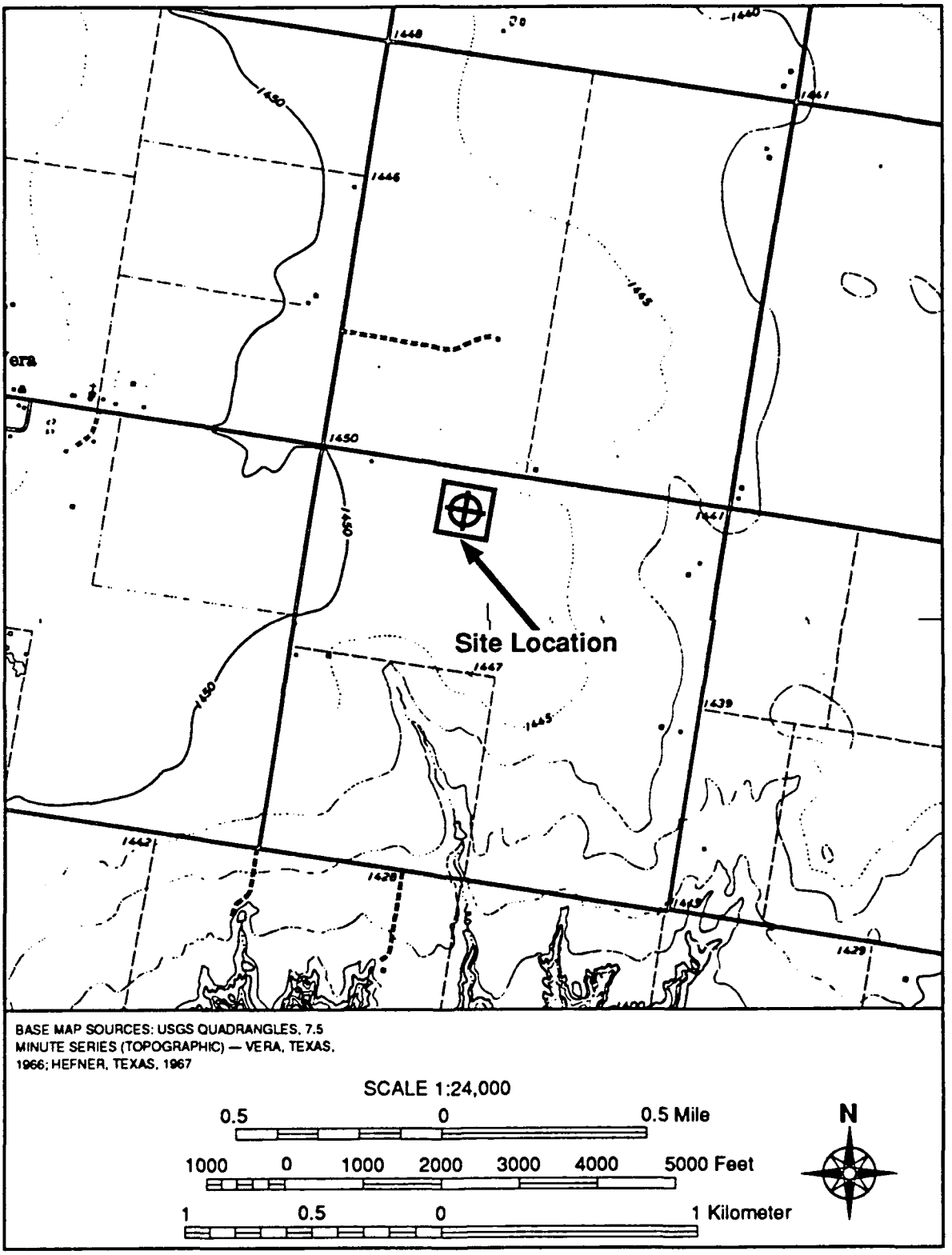


FIGURE B.2 TOPOGRAPHIC SETTING OF THE SCOTT SITE (CGS-3)

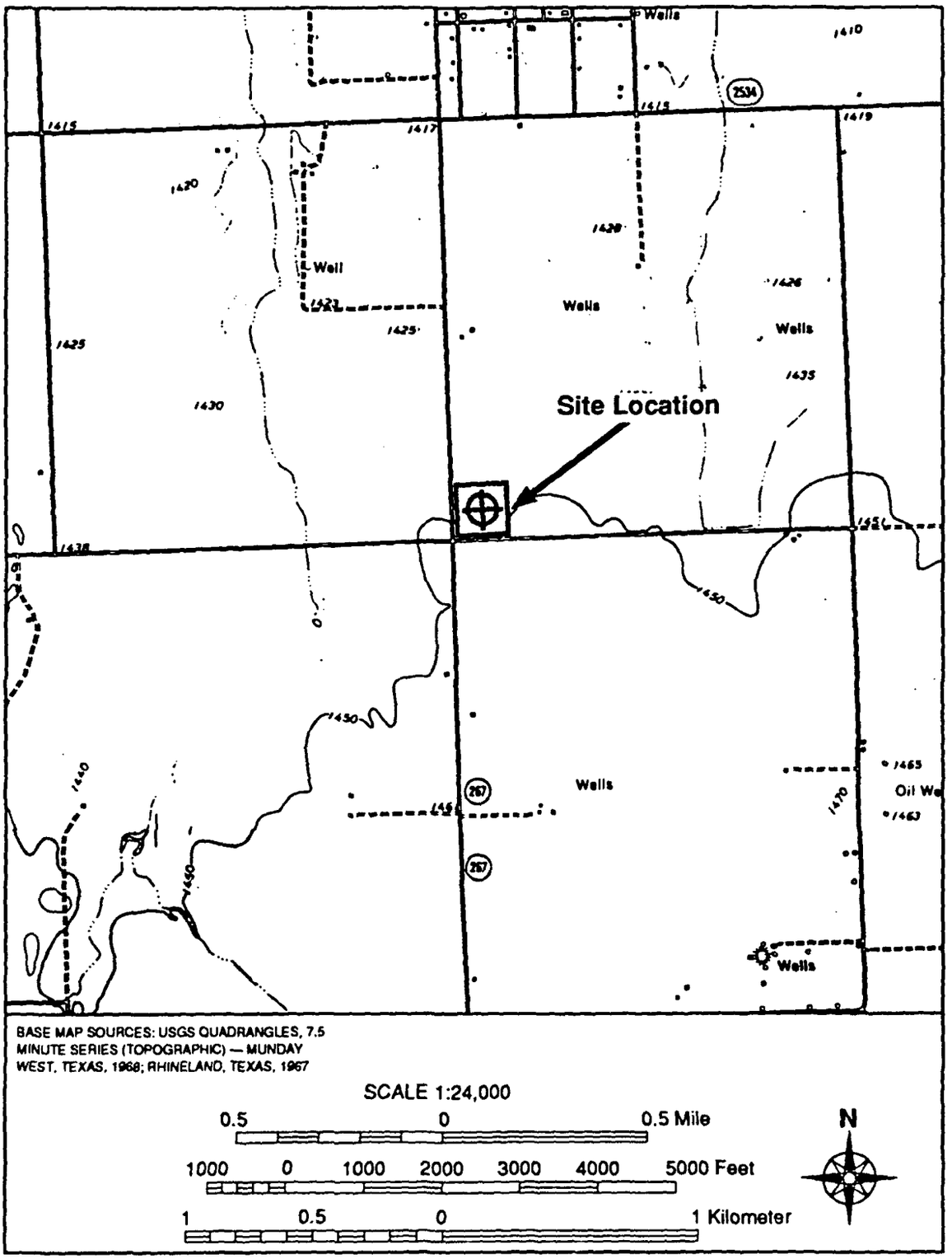


FIGURE B.3 TOPOGRAPHIC SETTING OF THE SMAJSTRLA SITE (CGS-5)

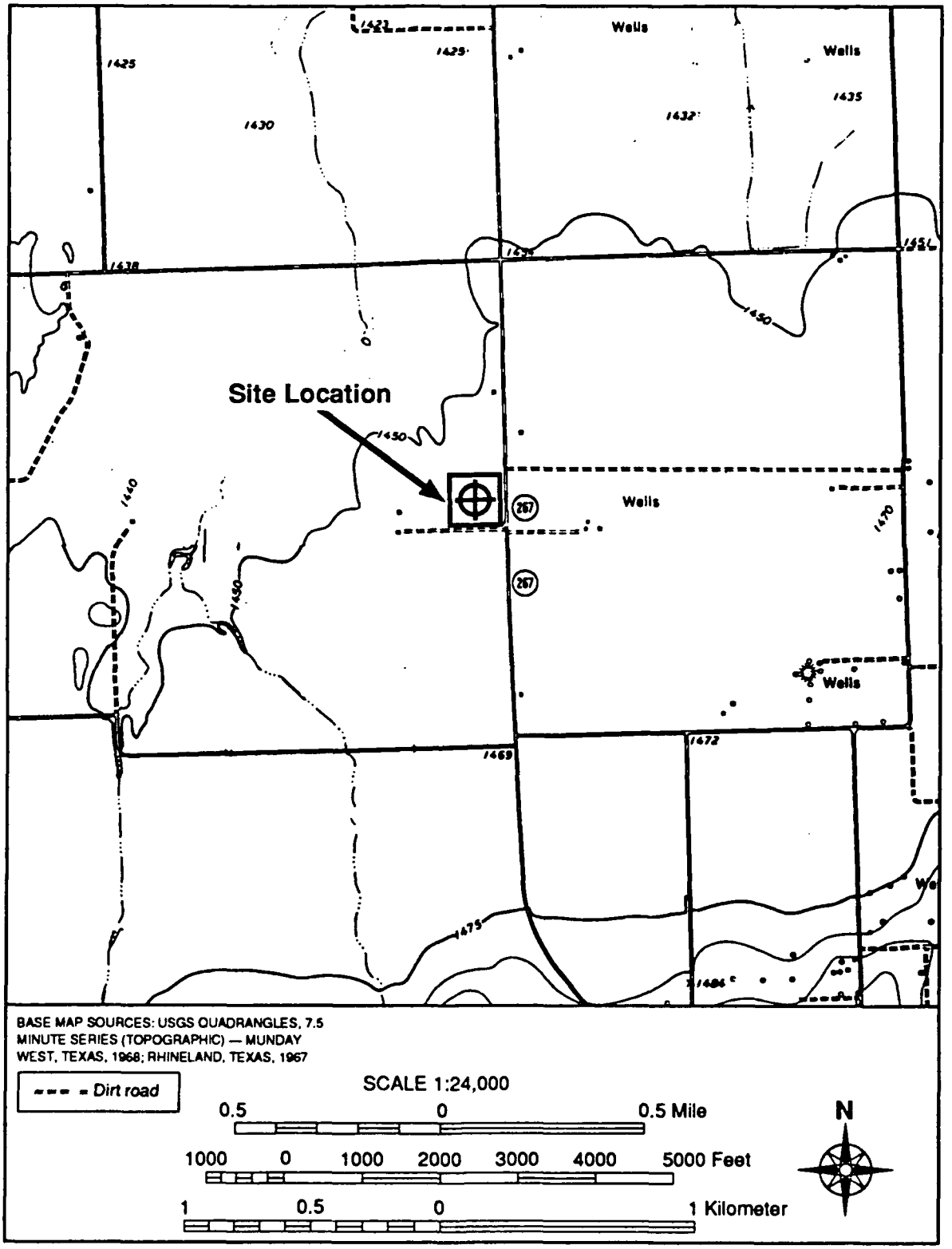


FIGURE B.4 TOPOGRAPHIC SETTING OF THE HOMER SITE (CGS-6)

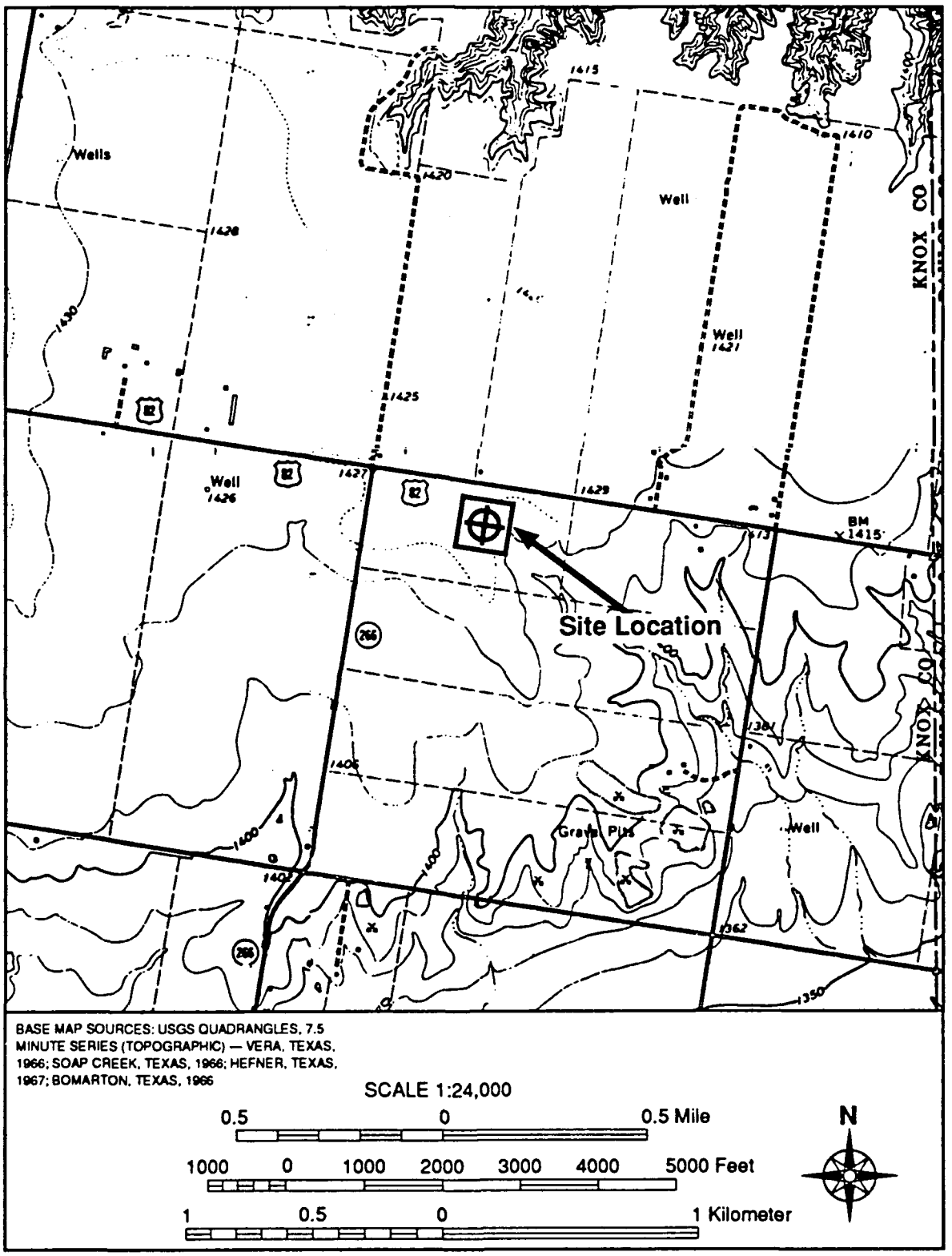


FIGURE B.5 TOPOGRAPHIC SETTING OF THE PARRIS SITE (CGS-7)

APPENDIX C

CORRESPONDENCE

CORRESPONDENCE

Appendix C documents contacts with the following federal and state agencies and Native American groups:

Individual	Agency	Date	Response
Robert M. Short, Field Supervisor	U.S. Department of the Interior, Fish and Wildlife Service	10-17-89	Attached
		01-17-90	Attached
		05-27-92	Attached
		12-22-92	Attached
James E. Bruseth, Ph.D., Deputy State Historic Preservation Officer	Texas Historical Commission	02-05-90	Attached
		06-01-90	Attached
James Steely, Deputy State Historic Preservation Officer	Texas Historical Commission	06-18-90	Attached
		04-22-91	Attached
		04-22-91*	Attached
		(*Incorrectly dated; actual date is 05-22-91.)	
Stan Graves, Director	Texas Historical Commission, Division of Architecture	07-22-91	Attached
Dale E. Sailors, Tribal Administrator	Kickapoo Traditional Tribe of Texas, Eagle Pass, TX	11-24-89	Attached
Frances Batisse, Chairperson	Alabama-Coushatta Tribal Office, Livingston, TX	A letter was sent on 11-09-89; no written response received to date. Phone communication on 02-13-91.	

Individual	Agency	Date Response
LeRoy Mimsey and Amos Pewenoskit	Apache Tribal Office, Anadarko, OK	A letter was sent on 11-09-89; no written response received to date. Phone communication on 02-14-91.
Kenneth Saupitty, Chairperson	Comanche Tribal Office, Lawton, OK	A letter was sent on 11-09-89 but no response to the letter or to several attempts at phone communication has been received.
J. T. Goombie, Chairperson	Kiowa Tribal Office, Carnegie, OK	A letter was sent on 11-09-89 but no response to the letter or to several attempts at phone communication has been received.
Culture Committee	Wichita Tribe, Anadarko, OK	A letter was sent on 11-09-89 but no response to the letter or to several attempts at phone communication has been received.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Ecological Services
9A33 Fritz Lanham Building
819 Taylor Street
Fort Worth, Texas 76102

2-12-90-I-12

October 17, 1989

Ms. Jeannette H. Nishida
Environmental & Technology Assessment Program
333 Ravenswood Avenue
Menlo Park, California 94025

Re: Ground Wave Emergency Network (GWEN) project, Knox and Baylor Counties, Texas.

Dear Ms. Nishida:

This responds to your October 13, 1989, request for environmental information on the referenced project. The current site under investigation is not near any National wildlife refuges, preserves, or sanctuaries. However, the site's proximity to the Brazos and South Fork of the Wichita Rivers should be carefully evaluated with respect to potential waterfowl, endangered species, and habitat impacts.

The Brazos River which bisects the circular Site Search Area (SSA) provides seasonally important resting/roosting habitat for Canada geese, sandhill cranes, and a variety of ducks. Waterfowl use the river's sandbars for roosting and resting between their feeding forays into the croplands of Knox and Baylor Counties. The SSA also lays within the migratory corridor of the endangered whooping crane (Grus americana), which could possibly use the river and nearby fields during their annual spring and fall migrations.

Siting of the GWEN project should consider the location of the structure with respect to the river and adjacent fields which are used for foraging. Specifically, the project should not be located between large grainfields and the Brazos River, or in fields adjacent to the river due to the potential for waterfowl collisions with the tower and/or guy wires.

Our only other concern with the GWEN project within the SSA involves the potential for impacting riparian habitats and brushlands associated with the Brazos and Wichita Rivers. These habitats support viable populations of white-tailed deer, turkey, and numerous other game and non-game species because of their rough topography and vegetative diversity. We recommend that any siting of the project within the SSA be restricted to upland areas out of the floodplains.

We hope this information assists in your environmental assessment activities. Please contact Mr. Tom Cloud, Senior Staff Biologist, of this office or call (817) 334-2961 if you have any questions or require further assistance.

Sincerely,

for Robert M. Short
Field Supervisor

cc: Regional Director, FWS, Albuquerque, NM (FWE/HC)

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Ecological Services
9A33 Fritz Lanham Building
819 Taylor Street
Fort Worth, Texas 76102

January 17, 1990

Robert T. Veale, Major, USAF
Deputy Program Manager, GWEN
Headquarters Electronic Systems Division (AFSC)
Hanscom Air Force Base, Massachusetts 01731-5000

Re: North Central Texas GWEN Relay Node Sites

Dear Major Veale:

This responds to your December 20, 1989, request directed to the Regional Director of the Fish and Wildlife Service in Albuquerque, New Mexico, for comments on the referenced subject. It is our understanding that you are currently evaluating five candidate sites in Knox County, Texas: three located near Vera and two near Rhineland.

Our office has previously coordinated with your contractor on primary fish and wildlife resource concerns associated with these sites, including potential impacts to threatened or endangered species, wetlands, and migratory birds. All five sites are currently under cultivation and are surrounded by predominantly agricultural lands. No wetlands are present on any of the sites. The sites are also not likely to be utilized by any threatened or endangered species or significant numbers of migratory birds. Therefore, our agency would not have major environmental concerns with any of the candidate sites.

The opportunity to comment on this proposal is appreciated.

Sincerely,

Robert M. Short

Robert M. Short
Field Supervisor

cc: Regional Director, FWS, Albuquerque, NM (FWE/HC)

CURTIS TUNNELL
EXECUTIVE DIRECTOR

TEXAS HISTORICAL COMMISSION
P.O. BOX 12276 AUSTIN, TEXAS 78711 (512)463-6100

February 5, 1990

Robert T. Veale, Major, USAF
Deputy Program Manager, GWEN
Department of the Air Force
Headquarters Electronic Systems Division (AFSC)
Hanscom Air Force Base, Mass 01731-5000

Re: Ground Wave Emergency Network (GWEN)
Five candidate sites in North Central Texas
(AIRFORCE, A5, D1c)

Dear Major Veale:

Thank you for the opportunity to review the project referenced above. Using the information you have provided, we have checked our files and find that we have no record of properties listed or eligible for listing on the National Register of Historic Places within the project or affected area. To our knowledge, a cultural resource survey has never been performed in the area.

A cultural resource survey of the project area in 1985 revealed there was no evidence of prehistoric or historic archeological sites on the land that will be impacted by the undertaking. The project may continue without further consultation with this office. However, it is possible that buried cultural materials may be present in the project area. If cultural materials are encountered during construction, work should cease in the immediate area; work can continue in the project area where no cultural materials are present. The Advisory Council on Historic Preservation should be contacted in accordance with 36CFR800.11.b.2. Please also notify the State Historic Preservation Officer (512/463-6096).

If we may be of further service, please advise.

Sincerely,

James E. Bruseth

James E. Bruseth, Ph.D.
Deputy State Historic Preservation Officer

BS/JEB/lft

THE STATE OF TEXAS

CURTIS TUNNELL
EXECUTIVE DIRECTOR

TEXAS HISTORICAL COMMISSION

P.O. BOX 12276 AUSTIN, TEXAS 78711 (512)463-6100

June 1, 1990

Lt. Col. Stephen Martin
Program manager, GWEN
Department of the Air Force
Hdqtrs Electronic Systems Div. (AFSC)
Hanscom AFB, Massachusetts 01731-5000

Re: Cultural resources survey of five GWEN candidate sites, Knox & Baylor Counties, Texas (AF, A5, A6, D1)

Dear Sir:

This office is in receipt of a report detailing the results of a cultural resources survey undertaken in Knox and Baylor counties in connection with a proposed GWEN site. Aside from several typographical errors and incomplete listings in the References section, the report is well researched and written.

After reviewing the document it is our opinion, that as described the proposed project will not affect any archeological resources listed or eligible for listing on the National Register of Historic Places. Mr. Bruce Jenson of the National Register department of this agency will evaluate the historic structures identified during the survey.

Based on the lack of significant archeological resources, the project may continue without further consultation with this office. If buried cultural material is encountered during construction, work should cease in the immediate area. The Advisory Council on Historic Preservation should then be notified in accordance with 36CFR800.11.b.2. Please also contact this office.

If we can be of further assistance, please contact Deborah Smith of my staff at 512/463-6096.

Sincerely,

James E. Bruseth, Ph.D.
Deputy State Historic Preservation Officer

DS/JEB/lft

cc: Ms. Jeannette Nishida, SRI

CURTIS TUNNELL
EXECUTIVE DIRECTOR

TEXAS HISTORICAL COMMISSION

P.O. BOX 12276 AUSTIN, TEXAS 78711 (512)463-6100

18 June 1990

Jeannette Nishida
Environmental and Technology Assessment Department
SRI International
333 Ravenswood Avenue
Menlo Park, CA 94025

RE: AF - Proposed relay node for North Central Texas GWEN, Knox County

P our request,

Our SHPO staff had conducted a review of the following property by applying state and federal criteria for historical designation:

*St. Joseph's Catholic Church, Rhineland, Texas

We have determined that this property is **ELIGIBLE** for listing in the National Register under Criterion C as a significant example of 20th century ecclesiastical architecture rarely seen in North Central Texas.

You should immediately contact Gerron Hite, staff architect with the SHPO Division of Architecture at 512/463-6094, for a determination of effect. Please refer in your correspondence to the Track Code listed below to expedite your effect and mitigation procedures.

The following properties in Vera, Texas, are **NOT ELIGIBLE** for listing in the National Register of Historic Places. No further review of this undertaking as it affects these properties is required.

*Primitive Baptist Church
*Vera Baptist Church
*Vera Methodist Church

We have determined that **MORE INFORMATION IS REQUIRED** to complete this review. Information provided indicates that the communities of Vera and Rhineland may contain other historic resources eligible under Criterion A. Resources such as the Rhineland Cemetery must be evaluated within the community's historic context. Please forward the following documentation for properties built before 1950. *Structures built after 1950 are not subject to SHPO review at this time.*

- ✓ Current photographs of at least two elevations of each structure and its relationship to surrounding sites. Clear snapshots are acceptable.
- ✓ Standard map of project area with locations and addresses clearly indicated.
- ✓ Date of construction and architect/builder.
- ✓ Brief history of each structure and its relationship to the community.
- ✓ *Indicate the track code and reviewer listed below* at the top of your correspondence when submitting this additional information.

You are required (36 CFR 800.7) to notify the U.S. Secretary of the Interior, through the SHPO's Archeological Planning and Review Department at 512/463-6096, *if buried archeological deposits are discovered in the course of any project.*

Thank you for your interest in the cultural heritage of Texas, and for your compliance with this federal review process.

Deputy State Historic Preservation Officer

Track Code: 90-05-3989
For questions about this review contact: Bruce Jensen, 512/463-6094

cc: Gerron Hite, Division of Architecture
Clara Brown, Knox County Historical Commission

TEXAS HISTORICAL COMMISSION

P.O. Box 12276 • Austin, Texas 78711 • 512/463-6094

STATE HISTORIC PRESERVATION OFFICE (SHPO)

Review of Federal Undertaking (funded or licensed), under the
National Historic Preservation Act of 1966 (16 USC 470) as amended.

SECTION 106 (36 CFR 800)

22 April 1991

Daniel Rutledge, Research Analyst
Environmental and Technology Assessment Department
SRI International
333 Ravenswood Avenue
Menlo Park, CA 94025

RE: AF - Ground Wave Emergency Network (GWEN), Vera Project Area,
Knox and Baylor Counties

Per your request,

Our SHPO staff has conducted a review of the draft report of the assessment of historic architectural resources within the Vera Project Area by applying state and federal criteria for historical designation.

We concur that the following properties **ELIGIBLE** for listing in the National Register of Historic Places under Criterion C for their significance as representative types of architecture typical of the rural setting. In addition, some properties are also eligible under Criterion A for their significant associations with the broad patterns of local history defined by the historic contexts presented in the report.

*Site V2-13 (aka Site V7-21) - A.E. Boyd Ranch: best surviving example of a rural farm complex in the project area
*Site V3-07 - Gray Homestead: good local example of the L-plan vernacular form with Queen Anne stylistic influences
*Site V3-12 - Blacksmith Shop: best surviving example of commercial property type in Vera
*Site V3-24 - Dr. Henderson House: good local example of the L-plan vernacular form surmounted by a hipped roof
*Site V5-10 - Simonizch Homestead: good local example of the I-house vernacular form
*Site V5-11 - John Decker House: good local example of the T-plan vernacular form
*Site V5-21 - Zimmer/Decker House: best surviving example of the vernacular dwellings constructed by German immigrants to the region
*Site V5-23 - Farmer's Union: Rhineland's best surviving example of commercial property type
*Site V5-34 - John Albus Farm: an unusual example of the Bungalow style with a hipped roof
*Site V5-38 - St. Joseph's Catholic Church: best local example of Gothic Revival ecclesiastical architecture; designed by Leo Diehlmann, a regionally important architect

We have determined that properties on the attached list are **NOT ELIGIBLE** for listing in the National Register. No further review of this undertaking as it affects these properties is required.

We have determined that **MORE INFORMATION IS REQUIRED** to complete our review of the following properties. A brief description of the required information is listed with each property. Receipt of this information within 30 days will facilitate our review of this project.

*Site V2-12 - photos, survey form, additional information on relationship to Boyd Ranch
*Site V3-08 - photos, survey form
*Site V3-09 - photos, survey form, additional information on history of usage of property
*Site V3-17 - photos, survey form, documentation of changes to historic fabric
*Site V5-02 (aka V6-04) - photos, survey form, additional information on house type and historic associations
*Site V5-15 - photos, survey form
*Site V5-19 - photos, survey form, documentation of changes to historic fabric
*Site V5-24 - photos, survey form, Birkenfeld bungalow, discussion of potential for creating crossroads historic district
*Site V5-27 - photos, survey form, Birkenfeld bungalow, discussion of potential for creating crossroads historic district
*Site V5-28 - photos, survey form, perhaps the best example of the Birkenfeld bungalow, discussion of potential for creating crossroads historic district
*Site V5-29 - photos, survey form, best example of cross gabled I-house form, documentation of level of historic integrity
*Site V5-31 - photos, survey form, documentation of changes to historic fabric
*Site V7-16 - photos, survey form, documentation of level of historic integrity
*Site V7-19 - photos, survey form, documentation of level of historic integrity

Implementation of the following suggestions will provide clarity in the final report:

*While the context on "Domestic Agricultural Development (1880-1930)" provides a strong analysis of the factors that historically shaped the region's built environment, the remaining contexts fail to address these issues at sufficient depth. Rather than attempt to bolster their shortcomings, it may be more expedient to combine the three into a context focused on community development patterns. This context would also clearly define the geographic scope of the study. Synthesizing information from each on the agriculturally based economy, the role of the transportation network in regional development, ethnic and racial settlement patterns, trading patterns, and exploitation of the area's natural resources should facilitate appraisals of the significance of the area's historic resources.

*Summaries of potentially eligible sites should include specific references to applicable National Register criteria and a statement indicating associated historic contexts within which they should be evaluated. Significance should be fully justified for each criterion cited.

*A full list of eligible properties should be included in the Abstract of the final report.

Attention to these details will facilitate our review. In addition, we require a full set of the photodocumentation, survey forms, and maps generated by the project for curation at our offices. We also require that you forward final copies of the report to public institutions in the area as a method of fostering public awareness of these resources. Copies should be forwarded to the Texas State Library and Archives, the Barker Texas History Center at the University of Texas at Austin, the campus library at Midwestern State University in Wichita Falls, as well as public libraries in Knox and Baylor counties.

Upon receipt of the requested information, we will provide you with final determinations of eligibility for historic resources within the Vera GWEN project area. Determinations of effect for eligible properties will be coordinated by Gerron Hite, staff architect with the THC Division of Architecture. Thank you for your interest in the cultural heritage of Texas, and for your compliance with this federal review process. We look forward to continuing consultation with you and U.S. Air Force officials.

Sincerely,

James W. Steely
Deputy State Historic Preservation Officer

Track Code: 91-03-2366
For questions about this review, contact: Bruce Jensen, 512-463-6094

cc: Gerron Hite, Division of Architecture
Melissa Voellinger, Espey, Huston & Associates

GROUND WAVE EMERGENCY NETWORK SYSTEM
VERA PROJECT AREA, KNOX AND BAYLOR COUNTIES
Track Code No. 91-03-2366

POTENTIALLY ELIGIBLE PROPERTIES DETERMINED INELIGIBLE BY SHPO:

Site V2-02 (aka V7-03) - loss of historic integrity/better examples of property type in region
Site V2-09 (aka V7-10) - loss of historic integrity/better examples of property type in region
Site V3-02 - loss of historic integrity/better examples of property type in region
Site V3-03 - loss of historic integrity/better examples of property type in region
Site V3-11 - loss of historic integrity/better examples of property type in region
Site V3-15 - loss of historic integrity/better examples of property type in region
Site V3-19 - loss of historic integrity/better examples of property type in region
Site V3-20 - loss of historic integrity/better examples of property type in region
Site V3-33 - loss of historic integrity/better examples of property type in region
Site V5-01 (aka V6-03) - loss of historic integrity/better examples of property type in region
Site V5-16 - loss of historic integrity/better examples of property type in region
Site V5-36 - loss of historic integrity/better examples of property type in region
Site V5-37 - loss of historic integrity/better examples of property type in region
Site V7-10 - loss of historic integrity/better examples of property type in region

SHPO CONCURRENCE ON PROPERTIES RECOMMENDED INELIGIBLE FOR LISTING:

Site V2-01
Site V2-03 THROUGH V2-08
Site V2-10 THROUGH V2-12
Site V2-14
Site V2-15
Site V3-01
Site V3-04 THROUGH V3-06
Site V3-09
Site V3-10
Site V3-13
Site V3-14
Site V3-16 THROUGH V3-18
Site V3-21 THROUGH V3-23
Site V3-25 THROUGH V3-32
Site V3-34
Site V5-02 THROUGH V5-09
Site V5-12 THROUGH V5-14
Site V5-17 THROUGH V5-20
Site V5-22
Site V5-25
Site V5-26
Site V5-30
Site V5-32
Site V5-33
Site V5-35
Site V5-39
Site V6-01
Site V6-02
Site V6-04 THROUGH V6-09
Site V7-01
Site V7-02
Site V7-04 THROUGH V7-09
Site V7-11 THROUGH V7-15
Site V7-18
Site V7-19
Site V7-20

TEXAS HISTORICAL COMMISSION

P.O. Box 12276 • Austin, Texas 78711 • 512/463-6094

STATE HISTORIC PRESERVATION OFFICE (SHPO)

Review of Federal Undertaking (funded or licensed), under the
National Historic Preservation Act of 1966 (16 USC 470) as amended.

SECTION 106 (36 CFR 800)

22 April 1991

Daniel Rutledge, Research Analyst
Environmental and Technology Assessment Department
SRI International
333 Ravenswood Avenue
Menlo Park, CA 94025

RE: AF - Ground Wave Emergency Network (GWEN), Vera Project Area,
Knox and Baylor Counties

Per your request,

Our SHPO staff has conducted a review of the amended report of the assessment of historic architectural resources within the Vera Project Area by applying state and federal criteria for historical designation.

We concur that the following properties ELIGIBLE for listing in the National Register of Historic Places under Criterion C for their significance as representative types of architecture typical of the rural setting and under Criterion A for their significant associations with the broad patterns of local history defined by the historic context presented in the report.

*Site V5-27 - Mrs. Joseph Albus House: good local example of the frame bungalow designed by Birkenfeld
*Site V5-28 - Francis Albus House: the best example of the bungalow designed by Birkenfeld, with unusual masonry finish (probably molded concrete blocks)
*Site V5-29 - St. Joseph's Church Sisters' House: best surviving example of cross-gabled I-house form, with strong historical associations

In combination with sites previously determined eligible in the CGS-5 study area (Sites V5-10, V5-11, V5-21, V5-23, V5-34 and V5-38), these properties constitute a significant concentration of historic resources in the Rhineland Community. Documentation provided by the report suggests the eligibility of National Register historic district focused on St. Joseph's Catholic Church. Although resources such as V5-24 and V5-31 have suffered diminished historic integrity, their associated outbuildings would nevertheless be considered contributing elements of a Rhineland Community Historic District.

We have determined that the following properties are **NOT ELIGIBLE** for listing in the National Register. No further review of this undertaking as it affects these properties is required.

*Site V2-12 - loss of historic integrity/better examples of property type in region
*Site V3-08 - loss of historic integrity/better examples of property type in region
*Site V3-09 - loss of historic integrity/better examples of property type in region
*Site V3-17 - loss of historic integrity/better examples of property type in region
*Site V5-02 (aka V6-04) - loss of historic integrity/better examples of property type in region
*Site V5-15 - loss of historic integrity/better examples of property type in region
*Site V5-19 - loss of historic integrity/better examples of property type in region
*Site V5-24 - loss of historic integrity/better examples of property type in region
*Site V5-31 - loss of historic integrity/better examples of property type in region
*Site V7-16 - loss of historic integrity/better examples of property type in region
*Site V7-19 - loss of historic integrity/better examples of property type in region

We look forward to receipt of the final report document. Determinations of effect for eligible properties will be coordinated by Gerron Hite, staff architect with the THC Division of Architecture. He may be contacted at 512/463-6094.

Thank you for your interest in the cultural heritage of Texas, and for your compliance with this federal review process. We look forward to continuing consultation with you and U.S. Air Force officials.

Sincerely,

(James W. Steely)

James W. Steely
Deputy State Historic Preservation Officer

Track Code: 91-05-3305
For questions about this review, contact: Bruce Jensen, 512-463-6094

cc: Gerron Hite, Division of Architecture
Eugene Foster, Espey, Huston & Associates

THE STATE OF TEXAS

CURTIS TUNNELL
EXECUTIVE DIRECTOR

TEXAS HISTORICAL COMMISSION

P.O. BOX 12276 AUSTIN, TEXAS 78711 (512)463-6100

July 22, 1991

Mr. Daniel Rutledge
Research Analyst
Environmental Assessment Program
SRI International
333 Ravenswood Road
Menlo Park, California 94025

RE: U.S. AIR FORCE GROUND WAVE EMERGENCY NETWORK (GWEN), KNOX AND BAYLOR COUNTIES, TEXAS

Dear Mr. Rutledge:

This letter is in reference to our receipt of the documentation for the four historic sites and/or district within the 1.5-mile radius of each potential tower site. We reviewed this material and have the following determinations of effect:

- Walker Site (CGS-2) and A.E. Boyd Ranch (V2-13): *no effect.*
- Scott Site (CGS-3), Gray Homestead (V3-07), Blacksmith Shop (V3-12), and Dr. Henderson House (V3-24): *no effect.*
- Rhineland Historic District (CGS-5): *no adverse effect.*
- Parris Site (CGS-7) and A.E. Boyd Ranch (V7-21): *no effect.*

These determinations of effect are in accordance with 36 CFR 800. If you have any questions or comments, please feel free to contact Gerron Hite at 512-463-6094.

Sincerely,

Stan Graves, AIA, DSHPO
Director
Division of Architecture

SG/GSH/lah

K I C K A P O O
Traditional Tribe of Texas

Tribal Office
P.O. Box 972
Eagle Pass, Texas 78853
(512) 773-2105
(512) 773-2303

November 24, 1989

Environmental Consultant
Environmental and Technology
Assessment Program
SRI International
333 Ravenswood Ave
Menlo Park, CA 94025

Dear Ms. Jeannette Nishida:

The Traditional Council of the Kickapoo Traditional Tribe of Texas have reviewed the letter dated November 9, 1989 from your firm and have discussed the possibility of the existence of Kickapoo burial sites or other sensitive locations near Vera, Texas with the traditional tribal religious leaders.

The Traditional Council can find no reasons to oppose the location of a Radio Communication Relay Node site of the Ground Wave Emergency Network (GWEN) Project near Vera, Texas.

The Traditional Council would also like to take this opportunity to thank SRI International and Contel Federal Systems, Inc. for their sensitivity to Kickapoo and Native American Concerns.

Best Wishes on your project.

Sincerely,

Dale E. Sailors
Tribal Administrator

cc: file

United States Department
of the Interior
Fish and Wildlife Service
Ecological Services
Attn: Mr Robert M. Short
~~9A33 Fritz Lanham Building~~
~~819 Taylor Street~~
~~Fort Worth, TX 76102~~
711 Stadium Drive East
Suite 252
Arlington TX 76011

RE: U.S. Air Force Ground Wave Emergency Network (GWEN) Project in North Central Texas

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This is to verify that no changes have been made to the list of federally-designated threatened, endangered, or candidate species sent on October 17, 1989.

Robert M. Short

Robert M. Short

5/27/93
Date

Changes have been made to the list of federally-designated threatened, endangered, or candidate species since our correspondence to you on October 17, 1989. Enclosed is a new list of species.

Robert M. Short

Date

United States Department
of the Interior
Fish and Wildlife Service
Ecological Services
Attn: Mr Robert M. Short
711 Stadium Drive East
Suite 252
Arlington, TX 76011

RE: U.S. Air Force Ground Wave Emergency Network (GWEN) Project in North Central Texas

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This is to verify that no changes have been made to the list of federally-designated threatened, endangered, or candidate species sent on May 27, 1992.

Robert M. Short

12-22-92
Date

Changes have been made to the list of federally-designated threatened, endangered, or candidate species since our correspondence to you on May 27, 1992. Enclosed is a new list of species.

Robert M. Short

Date

APPENDIX D

GLOSSARY

GLOSSARY

Abbreviations and Units of Measure

AM	Amplitude Modulation
ATU	Antenna tuning unit
BIA	Bureau of Indian Affairs
BLS	Bureau of Labor Statistics
BUPG	Back-up power group
CGS	Candidate GWEN site
dBA	Decibels on the A-weighted scale, which is a measure of the intensity of the sounds people can hear
EA	Environmental Assessment
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement; in this document, the term refers to the FEIS for the GWEN Final Operational Capability that was released in September 1987 by the U.S. Air Force, Electronic Systems Division, Hanscom Air Force Base, Massachusetts

FICWD	Federal Interagency Committee for Wetland Delineation
FOC	Final Operational Capability, the third phase of development of GWEN
FONSI	Finding of No Significant Impact
GPO	Government Printing Office
GWEN	Ground Wave Emergency Network
HEMP	High-altitude electromagnetic pulse
IICEP	Interagency and Intergovernmental Coordination for Environmental Planning, the formal review process for the EA
kHz	Kilohertz
LF	Low frequency
mg/l	Milligrams per liter
µg/l	Micrograms per liter
NPDC	National Planning Data Corporation
NRC	National Research Council, the principle operating agency of the National Academy of Sciences and the National Academy of Engineering
NRHP	National Register of Historic Places

NWR	National Wildlife Refuge
PAWS	Potential areawide sites; the portion(s) of an SSA left after application of those siting criteria that do not require a field survey, such as the location of national and state parks
PCGS	Potential candidate GWEN site; any site that is identified from roadside surveys as suitable for further investigation
PGS	Preferred GWEN site; the CGS identified by the Government that represents the Government's preferred location for a relay tower
PGSR	Preferred GWEN Site Report
PIEMS	Petroleum Information Energy Map Services
PSER	Preliminary Site Evaluation Report
SCS	Soil Conservation Service
SHPO	State Historic Preservation Officer; the person responsible for administering the National Historic Preservation Act at the state level, reviewing National Register of Historic Places nominations, maintaining data on historic properties that have been identified but not yet nominated, and consulting with federal agencies concerning the impacts of proposed projects on known and unknown cultural resources
SSA	Site search area; the 250-square-mile area within which four to six CGSs are identified; the SSA is the area within a 9-mile radius of a set of nominal coordinates in the network design. It is used as a manageable range in which to conduct siting investigations

TAC	Texas Administrative Code
TDHPT	Texas Department of Highways and Public Transportation
TLCC	Thin Line Connectivity Capability; the second phase of development of GWEN
TPWD	Texas Parks and Wildlife Department
UHF	Ultrahigh frequency (band); specifically 300 to 3,000 megahertz
USAF	United States Air Force
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VMC	Visual Modification Class

Definitions

Air pollutant	An atmospheric contaminant, particularly the 15 atmospheric contaminants specified in federal and most state regulations
Anaerobic	Occurring in the absence of free oxygen

Alluvial	Pertaining to loose river sediments, such as clay, silt, sand, and gravel
Avian	Pertaining to birds
Caliche	A hard soil layer cemented by calcium carbonate and found in arid or semi-arid regions
Candela	A unit of measure of the intensity of light equal to the brightness of one candle
Caprock	A resistant rock layer that protects underlying rock units from erosion
Clast	A rock fragment
Coliform	Pertaining to or resembling the colon bacillus; indicates presence of sewage pollution in water
Cultural resource	Prehistoric, Native American, and historic sites, districts, buildings, structures, objects, and any other physical evidence of past human activity
Escarpment	A steep slope resulting from erosion or faulting that separates two comparatively level surfaces
Evaluative criteria	Applied to portions of a potential siting area for a GWEN facility to determine its suitability. Areas that rank low against evaluative criteria may be excluded from consideration, or given a low priority in the site selection process

Evapotrans-piration	Water returned to the air by direct evaporation or transpiration by vegetation
Exclusionary criteria	Criteria used to eliminate or exclude highly sensitive areas or areas that do not meet the limits of acceptable performance from consideration for GWEN facilities
Fault	A break in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust; adjacent surfaces are differentially displaced parallel to the plane of fracture
Fauna	Animals collectively, especially the animals of a particular region or period
Federal jurisdictional wetland	As defined in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (GPO 1989-236-985/0036), a wetland is a class of habitats distinguished by the presence of saturation to the surface or standing water during at least 1 week of the growing season (wetland hydrology), a soil type characteristic of saturated or poorly drained conditions (hydric soils), and the predominance of plants that only or mostly occur on wet sites (hydrophytic vegetation)
Floodplain	Land adjacent to a river that is commonly covered by water during high flow periods
Forage	Seeking of food conducted by animals
Forb	A herbaceous plant other than a grass, especially one growing in a field or meadow

Ground plane	A part of the antenna system consisting of buried copper wires that extend radially from the base of a GWEN tower for a distance of approximately 330 feet
Habitat	The place normally occupied by an organism
Historic properties	For the purposes of this EA, historic properties are those aboveground structures and resources that are listed or eligible for listing on the National Register of Historic Places
Hydric soil	A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part
Megafauna	Large mammals such as bison and mammoths
Native American	A generalized reference to an individual whose ancestry may be traced to one of the indigenous American cultures
Noncalcareous	A soil lacking measurable amounts of calcium carbonate or magnesium carbonate; not chalky
Paleofauna	Past or ancient animals
Paleonto-logical	Pertaining to fossils or the study of fossils
Permian	The last period of the Paleozoic era
pH	A measure of acidity in which the lower the number, the more acidic the substance; 7 represents neutrality

Phase I archaeological survey	A survey designed to identify properties that are listed, eligible for listing, or potentially eligible for listing on the National Register of Historic Places within the area that would be affected by the proposed project
Pleistocene epoch	The earlier of the two epochs comprising the Quarternary Period, beginning about 2 million years ago and ending about 10,000 years ago
Prime farmland	Land that contains soils having high crop production either naturally or through modification; the U.S. Soil Conservation Service is responsible for designating prime farmland
Raptor	Birds that feed on live animals
Riparian	Pertaining to the bank of a natural course of water
Top-loading element	Portions of the antenna that extend diagonally from the top of the tower, which strengthen the signal and provide additional structural support, like guy wires